

PUBLIC HEALTH REPORTS

In this issue



U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service



PUBLIC HEALTH REPORTS

Volume 76 Number 8

AUGUST 1961

Published since 1878

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Volunteers in the Baltimore City Health Department supervise preschool children at a well-baby clinic and perform the phosphatase test to determine if milk is pasteurized properly. Story on the teenagers' summer work appears on pages 665-670.

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PEEPLES, WILLIAM J. (Montgomery County Health Department, Rockville, Md.)
SPIELMAN, D. W., and MOODY, MAX D.: *Field application of fluorescent antibody technique for identification of group A streptococcus.* *Public Health Reports, Vol. 76, August 1961, pp. 651-654.*

A field study of the fluorescent antibody method for identification of group A streptococcus was conceived on the principle that the method would give private physicians an accurate diagnosis within 4 to 5 hours from the time a specimen was submitted rather than the 3 to 5 days often required with precipitin grouping methods. The study was undertaken by the Montgomery County Health Department through cooperative arrangements with the Special Research Unit of the Public Health Service's Communicable Disease Center.

Specimens were collected at first on cotton swabs placed in sterile culture

tubes and submitted to the laboratory within 2 hours. Later a filter paper collection kit, which could be mailed to the laboratory, was used. Conventional cultures and precipitin grouping tests were run in parallel with fluorescent antibody tests.

The fluorescent antibody technique was found to be 95 percent in agreement with the conventional 2- to 4-hour broth culture method, but somewhat more sensitive. The technique is a rapid, accurate, practical procedure that can be used by any local or State public health agency or private laboratory.

MORRISON, S. M. (Colorado State University), **FAIR, J. F., and KENNEDY, K. K.:** *Staphylococcus aureus in domestic animals.* *Public Health Reports, Vol. 76, August 1961, pp. 673-677.*

An investigation was initiated at the Colorado State University Veterinary Clinic, Fort Collins, to study the role of domestic animals as a focal source of transmission of potentially pathogenic, antibiotic-resistant, coagulase-positive *Staphylococcus aureus* in the community. Nasal and swab samples were taken from animals (canine, feline, bovine, and equine). A high percentage (89.4) of the

animals yielded staphylococci, with 56 percent yielding coagulase-positive isolants. Marked resistance to penicillin, dihydrostreptomycin, and terramycin was shown by these *S. aureus* isolants. Although 80/81 phage type was isolated four times, no correlation could be established between phage type and resistance to a given set of antibiotics.

ROGERS, PERRY B. (Jefferson County Department of Health, Birmingham, Ala.),
COUNCIL, CHARLES R., and ABERNATHY, JAMES R.: *Testing death registration completeness in a group of premature infants.* *Public Health Reports, Vol. 76, August 1961, pp. 717-724.*

Unlike birth registration, there is a dearth of information relative to the completeness of death registration.

This is due primarily to two factors: (a) the fact that there is no simple, inexpensive method of testing death registration completeness and (b) the widespread belief that registration of deaths is not a major problem since registrars have some control over death registration through the burial permit system.

Through special studies in the field of infant mortality, the North Carolina State Board of Health was made aware that death registration completeness for infants left much to be desired. The

present study was designed to effect a method of determining the death registration completeness of premature infants weighing 1,500 gm. or less at birth and to use the method developed in measuring death registration completeness for this group of infants. The results are encouraging and suggest that the methods used in this study could be used among other groups of infants in measuring death registration completeness.

The study emphasizes the need for greater efforts in promoting death registration among infants in the low weight groups.

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groups.

Total Fitness

Physical fitness is essentially a part of total fitness . . . of an appropriate balance for our young people: healthy and vigorous bodies, alert and intelligent minds, and the emotional stability required to live in this period of history. . . .

There are several specific things the schools can do. I recommend that their programs include identification of the physically deficient pupil. Pupils having acute or correctible problems should be referred to medical authorities. Physical development should be made the goal of physical education classes. The physical appraisal should include physical achievement tests. Strength, agility, and flexibility are as essential to physical fitness as proper eyesight and hearing. . . .

Tests not only provide the best means of measuring achievement, but physical achievement tests permit self-evaluation and provide a strong motivation for development within the individual pupil.

Where individual communities or States have been using valid comprehensive tests, their continued use is urged. Each school should base its instructional program on the ability of the pupils to meet and surpass the test norms.

It is recommended that all students spend a minimum of 15 minutes a day participating in conditioning exercises and developmental activities designed to build vigor, strength, flexibility, endurance, and balance. In the remaining available time, balanced activity programs should be provided.

The emphasis must be placed on quality in physical fitness programs. But elaborate and expensive facilities and equipment are not necessary. . . . Minimum equipment, proper standards, and effective teaching and administration will do. . . .

All schools should provide a curriculum based on the health needs of children and youth, utilizing the health resources within the community and State for strengthening the instructional program. These include official and voluntary agencies and professional groups such as medical and dental.

Special emphasis should be placed on the competitive experience as a motivating factor. Its importance in the American tradition for growth and development has been understood in the give and

take of games. These games can be intramural sports for all boys and girls in grades 4 through 12, or for the athletically gifted in interscholastic athletics.

Sports and fitness clubs for both boys and girls should be organized in such activities as hiking, cycling, horseback riding, camping, skating, skiing, aquatic activities, and gymnastics. These and other activities can be incorporated into school and community recreation programs. Cooperation between school and public recreation programs is important.

Schools should provide opportunities for post-school youth and adults of the community to develop and maintain desirable levels of fitness. This can be done through special adult education classes and by extension of the community school program.

Colleges and universities with the qualified staff and research facilities should be encouraged to become training centers for the development of leadership in health and physical fitness. Institutes for the training of local, State, and regional leaders should be conducted to accelerate the fitness movement.

There is a trend today toward the establishment of community schools. These schools utilize their leadership, facilities, and other resources to serve both the education and recreation needs of the entire community. It is important that the schools establish an effective working relationship with the other agencies in the community.

The school is frequently the logical agency to take the initiative in forming a school-community health and fitness council. In many instances, existing councils or committees can assume the added responsibility for health and fitness.

Voluntary youth-serving agencies all have valuable contributions to make to the full range of experiences needed by youth. Effort should be made to get the cooperation of governmental agencies, religious groups, recreational groups, and all youth-serving agencies in dealing with the physical fitness problem.—*Excerpt from address by ABRAHAM RIBICOFF, Secretary of Health, Education, and Welfare, before the 51st Annual Meeting of the National Council, Boy Scouts of America, at Detroit, Mich., June 2, 1961.*

Occupational Medicine and Public Health

ROBERT A. KEHOE, M.D.

THERE is need for some clarification of the role of occupational medicine as a field of preventive medicine in relation to the health of the public as well as to that of the working population. The following paragraphs may apply to some extent to the practice of occupational medicine in industrial nations generally, but since the patterns of medical practice in the United States differ in certain respects from those elsewhere, it seems wise to adhere fairly closely to the local scene in this discussion. Furthermore, I have deliberately differentiated occupational medicine from general medical practice in an occupational setting in order to emphasize the physician's task in the management of occupational hazards. For I am concerned here, among other matters, with professional relationships which, once established, are more satisfactorily modified gradually from within than disrupted from without.

The Present Situation

Despite the developments of recent years that have tended to define the scope and functions of occupational medicine and to establish it as a specialized field of medical practice, there is little evidence of a concerted attitude or a unified basis for action within the profession generally. Under these circumstances, the description of the job of the physician in industry is more likely to be supplied by industrial management than by the profession, and it is not strange,

therefore, that this job often turns out to be indistinguishable, in substance and in spirit, from that of any other technical or administrative employee in the business organization. The job fits into the organization wherever it pleases the management to place it, to the credit or discredit of the physician or physicians concerned and of the profession as a whole. It is early—too early, no doubt—in the life of this youthful segment of organized medicine for it to achieve general recognition within the industrial community. But it is high time that the profession itself should gain some awareness of its mission within industry. “The fault” in this situation as in many another “is in ourselves.” For there is still an opinion, strongly and widely held within the profession, that any really good physician is competent to engage in such practice without any special training or even experience. Also prevalent in certain circles in preventive medicine, especially among those trained or experienced in public health practice, is the impression that their training or experience has constituted an adequate preparation for the practice of occupational medicine. Even more common is the belief that a few weeks of indoctrination or a short period of tutelage in certain special techniques will suffice to convert any physician into a reasonably capable practitioner of occupational medicine.

There is just enough validity in these views to give them a certain plausibility and to contribute to the confusion of those who otherwise might seek to obtain sound preparation for careers in occupational medicine. Under the present conditions in American industry, the principal but not the sole site of the practice of occupational medicine, almost any physician who enters the field can make significant con-

Dr. Kehoe is director of the Kettering Laboratory, Department of Preventive Medicine and Industrial Health, College of Medicine, University of Cincinnati, Ohio. The article is based on a paper given at the American College of Preventive Medicine meeting in San Francisco, November 3, 1960.

tributions to the health of the workmen for whom he assumes some responsibility. He may not see what most needs to be done, and he is unlikely without training to direct his efforts effectively, but if he is sincere, alert, and willing to work, he will find need for his services and opportunities to give them. For, on the one hand, occupational medicine calls for good clinical medicine, for well-substantiated diagnosis in the case of individual workmen, and even for therapy in certain instances. On the other hand, it concerns itself with the appraisal of the health of groups in the population, bringing into play appropriate applications and adaptations of the disciplines of epidemiology and biometry which have been developed so successfully in public health. But still more than familiarity with these disciplines is required of the industrial physician if he is to meet the needs of the times, for he must combine with the skills of the clinician and the epidemiologist the special knowledge of the toxicologist, the insight needed to explore the often obscure hazards and stresses of modern industrial environment, and the capacity to seek out and activate the technical and managerial abilities available in the industrial organizations in the interest of good industrial hygiene. To these qualities must be joined social wisdom, born of compassion and human understanding, sharpened by familiarity with the social and behavioral sciences, and based on a good grounding in the historical development and present organic structure of modern industry.

These are the requirements that have set a satisfactory pattern for the performance of the physician in occupational medicine and have dictated that the specific points for its application shall be at the sites of men's occupations. These requirements have created the demand for a new and special type of professional training. Such training can, of course, be acquired on the long and hard road of experience and such has been the lot of most of those now engaged in this field of practice. But it can now be obtained in a better ordered and more expeditious educational regimen, more closely attuned to the urgent needs of an industrial society. Put in simple terms, the demand is for physicians who understand or can learn

by intensive study to understand the impacts of the environment of our technological and highly organized industrial society on people, individually and collectively, and who will employ their professional talents strategically, at the appropriate sites, in the control of such impacts within physiological limits.

With but few exceptions, the most hazardous occupational sites, as well as those which involve the largest numbers of the working population, are situated within organized industries. Moreover, industrial employees can be studied and supervised more efficiently and effectively than can those who work in the widely scattered occupations of the farm and the household. The greatest present unsatisfied need for medical skill is found in industry, and it seems certain that nowhere else can American physicians contribute so much to the health of this Nation at this time. If this should appear to be a rash statement, consider certain simple and readily verifiable facts.

1. The industrial population of the United States numbers more than 60 million persons.
2. Technological developments in American industry have resulted in the exposure of industrial employees to countless numbers and types of inadequately explored chemical and physical hazards.
3. The incidence of the known varieties of occupational disease within our industrial population is unknown, and the unrecognized, non-disabling impairments of health that must certainly occur within this vast population have yet to be explored.
4. The large proportion of physicians employed in industry in some part-time or full-time capacity are untrained or poorly trained in occupational medicine and are so utilized as to be relatively ineffectual.
5. The total number of physicians fully employed in the tens of thousands of busy industrial plants in this huge country is somewhat less than 5,000 and is probably nearer to 3,000.

It is only fair to recognize that the lack of physicians in industry is counteracted in some degree by the services of industrial nurses, but these too are in short supply. American industry has an almost unique and highly beneficial feature; increasingly the physical and chemical hazards of industry are being sub-

jected to control through the efforts of technical personnel in the field of industrial hygiene. The technical designers and operators of industrial processes have also learned much and have applied their knowledge in the development and use of equipment and procedures which contribute to the diminution of occupational hazards, while basic improvements in machinery and the advent of automation have introduced safety factors into the day's work. Without these nonmedical contributions to industrial hygiene, the default of medical science and education in the modern industrial community would be glaringly obvious.

The fact remains, nevertheless, that the threats visited upon our working population and upon our industrial society generally by the technological revolution are serious, are increasing in number and type, and are unfathomed and currently unfathomable by the available medical and hygienic resources that are brought to bear upon them. This is not to indulge in harsh criticism, or to suggest that physicians, medical investigators, and medical educators have been idle or irresponsible. On the contrary, the achievements of our contemporary medical leaders and colleagues have been notable. But it must be recorded and granted that their attention has been directed toward the further understanding of the older and more familiar as well as the more baffling forms of human disease and toward their therapy, rather than toward the recognition, elucidation, and control of the new threats which have been multiplied around us in our places of work and elsewhere by the inventive genius of our intensely curious, industrious, and venturesome technologists.

Remedial Action

The problem I have outlined would seem to demand prompt action for its early solution, and insofar as such a solution can be afforded by physicians, a much greater concentration of professional personnel and effort within industry would seem to be required. This is not to indicate that there is not a corresponding need for greater attention on the part of all agencies in preventive medicine and public health—Federal, State, and local health depart-

ments—to problems of industrial health and to community problems derived from industry. These agencies can and should investigate and disclose the existence of occupational hazards, take appropriate action under the laws to focus more and more attention upon such hazards, and aid in their elimination. They should maintain services of information and consultation for the benefit of industry and the public. Until much better and more general medical services are available in industry, the vital statistics in relation to occupational disease for most of American industry will be incomplete and highly unsatisfactory, even misleading. But the publication of such statistics as are available will continue to serve a useful purpose which will be the greater if their shortcomings are recognized and counteracted by investigation and by advice to industry.

The solution of many, if not most, of the medical problems of industry will not be achieved, however, by the public agencies even with greatly augmented financial resources. The information required for the full appraisal of these problems and for their solution can come only from well-trained physicians and industrial hygienists who occupy responsible professional positions in industry. Only within the industrial organization can the special disciplines of occupational medicine and hygiene give effective guidance to industrial management toward the recognition and acceptance of its opportunities and responsibilities for the provision and maintenance of satisfactory conditions for the conduct of the day's work and for the safety and comfort of the community of which the industrial organization is a part. In our day, an industry is not well managed unless it is capably advised and supervised in medical matters. Such an industry will not proceed in ignorance or disregard of the facts to contaminate dangerously the food, the atmosphere, or the water supply of the community, nor will it wait until it is involved in the failure of other units of local industry to deal knowledgeably and intelligently with these matters. Under the guidance of a competent industrial physician the technical personnel of industry can solve these problems or, if necessary, can participate in an investigation that will provide a solution. It is shortsighted, often

dangerous, and usually unduly costly to follow the policy of *laissez faire* in such matters until legal compulsion is applied, for then the opportunities for unbiased discussion, impartial investigation, and satisfactory solution will often have vanished.

The scope of the professional services rendered to individuals by the practitioner of occupational medicine, or in a more restricted and more practical sense at this time, by the industrial physician, has been questioned in the past and will be questioned further and more searchingly in the future. Most of these questions have been answered in a general manner in such official pronouncements of organized medicine as that of the Council on Occupational Health, American Medical Association, in the constitution and bylaws of the American Academy of Occupational Medicine, and in the statements of purposes and policies of the American Board of Preventive Medicine.

From time to time these principles of professional behavior have been criticized as being expressions of the "division of labor" agreed upon within the profession for its own benefit or as further evidence of the fragmentation of medical practice whereby both patient and physician become so subdivided that the traditional and desirable doctor-patient relationship is lost. Other critics have held that the unit of medical care is the family and that industrial medical service should extend into the home and apply to the family as well as to the industrial employee. Many physicians and others in public health have seen medical practice in industry as an extension of public health practice into a new segment of community life and into a broadening field of more comprehensive medical care. In this attitude of mind they are aided and abetted, unintentionally for the most part, by the administrators of various programs for prepaid medical care, including those sponsored by industry for nonoccupational illness and disability.

It is not my intention to criticize or even to discuss the efforts to extend the benefits of good medical service to a larger proportion of our population under conditions that will spread the economic burden so that it can easily be borne by a prosperous society. All the statements in the preceding paragraph represent

misconceptions of the role of occupational medicine insofar as they include it in any general scheme for the provision of medical care. The essential feature of occupational medicine is not medical care but preventive medicine—preventive medicine in a grossly neglected field which requires for its reasonable success a highly specialized and concentrated attack upon the hazards and stresses of present-day life as these are displayed most prominently in the occupational environment of industry. To recognize these hazards, to seek them out, to understand them, to bring them under control at their sources, and to limit their uncontrolled dissemination beyond the confines of industry is to preserve ourselves against the increasing threats of a technological era which has revealed its destructive powers to those who have eyes with which to see. This is the special role of occupational medicine in our time.

There are other duties for the physician in industry to perform, and if he continues to be a good physician, he will perform these duties faithfully and well, but his primary responsibilities derive from his special knowledge, his special skill in the application of old and newly developed measures of preventive medicine for the protection of the industrial and the general population against the manmade perils of modern life. Medical care he must, in the nature of his primary work, leave to other physicians to whom he will refer those of his charges who seek or will accept his advice. Medical and surgical therapy, except in those situations in which his special knowledge is required, he delegates to other physicians and surgeons. He does not engage or compete with anyone in the field of medical care, for if he understands his work and adheres to it, there is no time for such activities.

It is conceivable that in some future time, when the current hygienic problems of industry shall have been solved and the physicians in industry shall have multiplied in number and skill to a point at which they can dispose of new problems with dispatch, they may extend their efforts into more common and less specialized fields of medical practice. For the present and for a long time to come there is little prospect for any trend in this direction. The physicians

in industry are too few, their work is too urgent, and their time is too limited to permit such wanderings from their main course. Their task is just begun, the trail has but been blazed, and much of the wilderness into which they venture is yet to be charted with accuracy. Therefore, all the more urgent is the recruitment of capable physicians into this field and their instruction and training in the fundamental characteristics and requirements of their life's work; not a bag of clinical, administrative, or technological tricks, but a sound approach to principles and general methods of inquiry, an understanding of the sources of information and advice, and the means of self-education in the midst of a changing scene.

What is required of the physician who enters the field of occupational medicine is, first, a point of view toward preventive medicine. But this is usually not sufficient. This point of view must be buttressed by training which will not dilute or detract from the knowledge and skill of the modern practicing physician but will provide him, in addition, with a reasonable competence in the disciplines of preventive, administrative, and legal medicine in industry and some grasp, which can be enlarged later, of the sociologic and economic history of mankind, particularly the institutional and organizational structure of his own society and the human relations that flow from this structure.

The special clinical knowledge of the industrial physician will lie in the field of industrial intoxications and physical stresses, and because of such knowledge he will be consulted by his colleagues in other fields of medical practice for diagnostic aid and for advice and guidance in the care of patients in the general population who have encountered the agents of such disease

in the home, on the farm, or elsewhere. For the products and instruments of industry are not confined within industry and are not always surrounded with adequate safeguards in their distribution and use. There is no substitute for experience in clinical medicine, and the time has not yet come when the practitioner of occupational medicine can free himself from such experience in his special field or in the more general field of human disease. Not only must he recognize and appraise the early signs of occupational disease, but he must also remember the potential effects of intercurrent illnesses, chronic degenerative diseases, and the aging processes upon human tolerance for industrial hazard and stress. If, then, the primary function of the industrial physician is to prevent occupational illness and disability and to cultivate and maintain the health of those who work, he will nevertheless depend upon his skill as a clinician and his breadth and depth of knowledge of medicine generally as the means to set the standards to be achieved by the methods of preventive medicine and industrial hygiene.

I do not mean to dissuade those now unprepared for industrial medical practice from entering upon it, for the need for more physicians in American industry is great, but let us not fail to visualize clearly the scope, the goals, and the responsibilities of occupational medicine, whether in industry or elsewhere in the places of employment of our people. Nor should we fail to recognize the need for a proper share of the best technical minds and the best trained minds in medicine, if a satisfactory solution of today's most serious problem of public health is to be achieved within a reasonable time.

Occupational Health Notes

Tests for Dishware Glazes

A standard method for testing the safety of glazes on dishes is being devised jointly by the U.S. Pottery Association, the Lead Industries Association, the Kettering Laboratories of the University of Cincinnati, and the National Bureau of Standards. The American Society for Testing Materials is developing a screening test for glazes that may be used at the plant or in health departments.

Action was taken to establish standards and tests after investigation of two cases of illness from lead absorption revealed the excessive lead content of dishware glaze used by a California company.

Lead Poisoning

A 4-year-old girl in South Dakota died from inhaling fumes from burning battery cases. Authorities learned that her father dismantled old cars to sell for junk and burned the battery cases in the kitchen stove. All 14 members of the family suffered from lead poisoning.

Lead fumes resulting from the use of blowtorches on surfaces covered with lead-based paints have been a serious hazard in old warships being dismantled in Washington State. Since much of the burning is done in confined areas, high concentrations of the fumes accumulate. One operation poisoned six workers.

Fire in Insecticide Warehouse

A fire in a California warehouse storing organic phosphate insecticides (parathion, TEPP, systox, and others) resulted in mild organic phosphate poisoning for about 10 persons, including several firemen.

City and county health department representatives and a State occupational health engineer supervised the cleaning up of the fire site. They set specifications regarding protective devices, medical supervision, and disposal of damaged materials. They specified that all waste materials be dumped in a

secluded portion of the public dumping grounds and covered with dirt, and that no material was to be dumped into a sewer or ditch.

The disposal and cleanup were carried out without ill effects to any worker; cholinesterase examinations did not reveal undue exposure to the insecticides.

Forestry Pilots Exposed to CO

While flying aerial tankers, U.S. Forestry Service pilots have been exposed to concentrations of carbon monoxide as high as $2\frac{1}{2}$ times the Federal Aviation Agency's recommended limit of 50 ppm. The tankers are used to spray chemicals on forest fires.

Collapsible Air Tent

A routine inspection of an air tent by a local fire marshal in Michigan led to an investigation that found an unusual hazard to public health. The tent is used by a church group and holds 500 to 700 persons. It was supported only by air pressure from a centrifugal fan. In a simulated power failure, the tent remained above head height for 35 minutes with doors closed, but collapsed within 35 seconds when the doors were open.

Solid supports for the tent were considered necessary in case of power failure. In addition, a gas-driven auxiliary power supply was installed.

Dry Cleaning

In a survey of 81 dry cleaning plants in Cincinnati, only 7 were considered to be in any way hazardous. Almost no carbon tetrachloride was used. Most plants used perchloroethylene; a few used Stoddard's solvent.

In Oklahoma, the first of several surveys to evaluate the hazards of perchloroethylene in coin-operated dry cleaning shops indicated the need for specific regulations for such establishments. Special attention is being paid in the surveys to possible hazards in machine failure to extract solvent from clothing, during machine repairs, in the disposal of solvent-soaked muck, as well as to ventilation and to provisions for accidental spilling of solvent.

State Government Offices

Pennsylvania's division of occupational health, after a complete inspection of State office buildings, found that operations and hazards common in industrial settings were duplicated in the government offices.

FIELD APPLICATION OF FLUORESCENT ANTIBODY TECHNIQUE FOR IDENTIFICATION OF GROUP A STREPTOCOCCUS

William J. Peeples, M.D.

D. W. Spielman, B.S.

Max D. Moody, Ph.D.

THE VIGOROUS treatment of streptococcal infections to prevent the sequelae of rheumatic fever and acute glomerulonephritis has received considerable emphasis in recent years. Early, accurate diagnosis of group A streptococcal infections associated with the complications, however, has not kept pace with therapeutic advances. Physicians often experience considerable delay in obtaining a laboratory diagnosis and must administer therapy to acute throat infections without knowing the etiological agent. The delay is due to the necessity of isolating a pure streptococcal culture, with subsequent preparation of extracts for use in precipitin grouping tests. Though beta hemolytic streptococcal organisms can be identified readily and quickly, the correct designation of the infecting streptococcal group requires several more days of testing.

Coons and his associates first described in 1942 a technique of bacterial identification which might offer rapid diagnosis (1). This was the fluorescent antibody technique, described more definitively in subsequent writings by Coons and Kaplan as an antigen-antibody reaction to identify mumps virus, pneumococcal polysaccharides, and rickettsia (2). Moody, Goldman, Thomason, and Cherry applied this same method to the identification of other organisms (3-5).

Moody, Ellis, and Updyke first developed an accurate method for the identification of streptococci using the fluorescent antibody technique (6). They showed that specific fluorescent antibody could be prepared and used for grouping streptococci in dried smears by stain-

ing only group A streptococci and also that a specific fluorescein-labeled antibody could be used to identify groups B, C, D, F, and G. Occasional cross reactions between organisms of groups A, C, and G were corrected by absorbing group A fluorescent antibody with group C organisms. This did not affect in any way the affinity of the antibody for group A cells.

As a result of this discovery, we proposed a study of the fluorescent antibody technique for streptococcal identification under field conditions using the facilities of a local health department. The study was conceived on the principle that the technique would give private physicians a diagnosis on suspected group A streptococcal disease within 4 to 5 hours after a specimen was submitted rather than the 3 to 5 days ordinarily required. The experimental design emphasized quality and correctness of technique rather than performance of a large number of tests.

Funds for the study were supplied by the Heart Disease Control Branch of the Public Health Service, and technical supervision, as well as the various reagents used in performing the tests, was provided by the Special Research Unit of the PHS Communicable Disease Center. The bureau of laboratories of the Maryland Department of Public Health, the Montgomery

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County Medical Society, and the Montgomery County Tuberculosis and Heart Association gave the plan their wholehearted support.

Methods

The field trial of the fluorescent antibody technique was divided into two parts by a change in the method of collecting and submitting specimens. From January through November 1959, specimens were collected by rotating two swabs together in the throat. The swabs were then placed in a sterile culture tube and submitted to the laboratory within 2 hours. Because of complaints from physicians about the rigid submission policies, a filter paper collection kit, which could be mailed to the laboratory, was used throughout the rest of the study.

Because of the large numbers of specimens sent in during the study, only the first six specimens received on Monday through Wednesday could be compared by complete laboratory identification. All specimens, however, received fluorescent antibody determination on both broth smear and culture. All labeled antibody, normal rabbit globulin, and precipitin grouping antisera were supplied by the Communicable Disease Center, and reference cultures and fluorescent antibody smears were sent periodically to the Center.

Swab Collection

One swab was washed in 0.5 ml. Todd-Hewitt broth, and melted sheep blood neopeptone agar was inoculated, poured into petri dishes, and incubated 24 to 48 hours at 35° C. Beta hemolytic colonies of streptococci were selected, and acid-heat extracts were prepared from packed cells of the resulting growth in Todd-Hewitt broth in accordance with Lancefield's method (7). Extracts were grouped in precipitin tests set up with antisera for groups A, B, C, D, F, and G streptococci.

The other swab was placed in 2.0 ml. of Todd-Hewitt broth and incubated 2 to 4 hours at 35° C. The swab was then squeezed against the side of the tube and discarded. The broth was cultured and beta hemolytic streptococci were grouped as described above.

The remaining broth was centrifuged and the sediment washed once in buffered physiological

saline, pH 7.2. Duplicate smears were made from the final sediment and allowed to air dry. After fixation with 95 percent ethyl alcohol, the smears were rinsed in distilled water and blotted dry. One smear was stained 30 minutes with fluorescein isothiocyanate-labeled globulin prepared from group A streptococcus antiserum and the other with labeled normal rabbit globulin. Excess and unreacted conjugate was removed by rinsing 10 minutes in two changes of buffered saline. The smears were finally rinsed in distilled water, blotted dry, mounted with glycerol saline (9 parts glycerin plus 1 part saline), and examined under the microscope for fluorescence. Smears were examined for intensity of the fluorescence reaction and concentration of cocci in chains. If typically greenish-yellow cocci in chains were observed in smears stained with group A conjugate, but not with normal rabbit conjugate, a positive report was made to the physician by telephone. He was told the results of the fluorescent antibody reaction and that a definitive written report would follow after conventional tests were completed.

Filter Paper Collection

When a filter paper specimen was received, the paper was aseptically removed from the kit and placed in a tube of Todd-Hewitt broth. This was incubated 3 to 5 hours. An additional 1 to 2 hours of incubation was necessary to obtain the amount of growth equivalent to that obtained after 2 to 4 hours incubation of broth inoculated with swabs. After incubation the paper was aseptically removed from the broth and placed on a culture plate of blood neopeptone agar and cross streaked with a loop for colony isolation. This was incubated at 35° C. for 24 to 48 hours.

The broth was centrifuged 10 minutes at 3,500 to 3,600 rpm and treated identically as the broth cultures previously described. Smears from the sediment (control and test) were also made, stained, and examined in the same fashion.

Results

During the first phase of the study, 158 swab specimens were examined. Comparison of the results obtained with the two conventional cultural methods indicated that the 2- to 4-hour

broth procedure is the more sensitive. All 64 specimens found positive at all were found positive by this method, whereas only 57 (89 percent) were positive by the direct swab method. Results of the fluorescent antibody test were therefore compared only with the results of the 2- to 4-hour broth method. Results of these two techniques showed agreement on 150, or 95 percent, of the 158 specimens (see table).

During the second phase of the study 998 specimens were examined. Comparison of 392 specimens by conventional culture on 3- to 5-hour broth and fluorescent antibody tests resulted in 94.4 percent agreement of the two methods (see table). On an additional 603 specimens conventional cultures were not grouped by precipitin tests, but beta hemolytic colonies were confirmed by fluorescent antibody tests, and these results were in 98.8 percent agreement with the results of the fluorescent antibody test on 3- to 5-hour broth cultures.

Discussion

The fluorescent antibody technique for rapid identification of group A streptococci is a practical, economical laboratory method which can

Comparison of fluorescent antibody method and conventional culture method of identifying group A beta hemolytic streptococcus

Conventional culture	Fluorescent antibody method		
	Positive	Negative	Total
	Swab collection of specimens ¹		
Positive.....	57	6	63
Negative.....	2	93	95
Total.....	59	99	158
	Filter paper collection of specimens ²		
Positive.....	158	14	172
Negative.....	8	³ 212	220
Total.....	166	226	392

¹ Broth incubated 2 to 4 hours.

² Broth incubated 3 to 5 hours.

³ 3 specimens showed absolutely no growth by either method.

easily be made available to the practicing physician. Specimens taken from patients can be mailed using filter paper kits as described or conventional cotton swabs protected by a glass tube. Physicians can receive results in 4 to 5 hours if specimens are brought to the laboratory and often in 24 hours if specimens are mailed locally. The results of this study indicate that the fluorescent antibody technique is as specific as precipitin grouping. All group A organisms were stained by this method.

Group A streptococci represented 538 specimens (93.4 percent) of the total of 576 specimens identified as beta hemolytic streptococci. Other groups were B, 10 specimens; C, 3 specimens; D, 2 specimens; F, 3 specimens; G, 7 specimens. Thirteen other specimens were identified simply as not belonging to group A. For an additional 603 specimens, no group identification other than group A was made. One strain of G organisms gave a 1+ intensity reaction in fluorescent antibody smear, but only group G organisms were recovered in culture.

Occasionally a staphylococcal strain was encountered which gave a weak fluorescent reaction. Such strains could be distinguished as staphylococci by their morphology and presented little difficulty since only typically stained cocci in chains giving good fluorescent reactions were reported.

Summary and Conclusions

In a study of the field application of the fluorescent antibody technique for identification of group A beta hemolytic streptococcus, the technique was found to be 95 percent or better in agreement with the conventional 2- to 4-hour broth culture method. The fluorescent antibody technique is a rapid, accurate, practical laboratory procedure that can be used by any local or State public health agency or private laboratory.

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Conference on Gastroenteric Morbidity

"A gastroenteric episode is an acute illness manifested by one or more of the following symptoms: nausea, vomiting, diarrhea, abdominal cramps or abdominal pain, with or without fever, which may be associated with other symptoms."

This definition of acute gastroenteric illnesses appeared to have general agreement at the Conference on Methods of Improving Reporting of Gastroenteric Morbidity, held October 12-13, 1960, at the Robert A. Taft Sanitary Engineering Center of the Public Health Service in Cincinnati, Ohio, with joint sponsorship of the National Vital Statistics Division.

Conferees agreed that gastroenteric episodes should include both foodborne and waterborne illness, but exclude organic and allergenic gastroenteric disease.

It was also agreed that acute gastroenteritis could be classified according to: (1) means of spread: (a) ingestion (foodborne, waterborne, and other), (b) inhalation (airborne and other), and (c) contact, and (2) etiology (infectious or intoxication).

Acute gastroenteritis is the second leading cause of acute morbidity, after acute respiratory disease, and is a substantial cause of mortality. In 1959 in the United States, 4,899 deaths were ascribed to gastroenteritis, including diarrhea of the newborn: 492 for infants under 4 weeks old, 2,862 for children 4 weeks to 2 years, and 1,545 deaths at 2 years of age and over.

More gastroenteric episodes could be prevented if knowledge of their occurrence were more complete, it was pointed out. Adequate morbidity reporting should reveal the extent of gastroenteritis and stimulate increased activity by State and local health departments. Epidemiologic followup of reported cases should be provided. Since active participation of local health departments is necessary for substantial improvement in reporting gastroenteric morbidity, efforts to improve reporting should be more intensive in metropolitan areas where good health services exist.

The need for strong health activities was stressed, with epidemiologic investigation in all localities accomplished by a team of epidemiologists and sanitarians, supported by laboratory facilities and staff. These teams might operate on a local basis or on a cooperative local-State or local-State-national basis, using suitable existing facilities.

Subcommittees were appointed to develop a list of reference laboratories available to State and local health departments for examination of materials implicated as the cause of acute gastroenteritis and to promulgate information concerning its occurrence and prevention.

The committee, chaired by Dr. William D. Schrack, Jr., director of the division of communicable disease control, Pennsylvania State Department of Health, invites suggestions from anyone interested in the problem of acute gastroenteritis.

Measuring Intercountry Expenditures for Medical Care

SELMA J. MUSHKIN, Ph.D.

APPREHENSION in social security circles throughout the world about the rise in medical care costs and concern of the World Health Organization about adequacy of expenditures for health have focused attention on measurement of intercountry price variations.

In 1959, the International Labor Office published a study, initiated some 6 years earlier, on the comparative costs of medical care in a selected group of countries, including countries in Europe and the Americas. One conclusion of this study was that the costs of medical care per person in the population tended to be in the order of $1\frac{3}{4}$ to 2 percent of average national income, at factor cost, per economically active person, whatever the country or the method of providing care (1).

During the same period, the World Health Organization turned its attention to examination of comparative expenditures for public health in the context of all health care (2,3). Preliminary investigation of the health care activities suggested about the same conclusion as that found by the ILO, namely, that despite differences in programs, health status of the populations, methods of organization of care, and methods of payment, almost uniformly 4 percent of gross national product was devoted to health.

This type of ratio obscures rather than clarifies the problem of use of resources for health care. Unless research is done on the components of health expenditures; on quantity

variations, utilization rates, and numbers of health personnel; on quality variations, and on price differences, we will gain little by way of a guide toward an understanding of the consequence of the choices before us in meeting the health problems of the United States and helping to meet those in the underdeveloped countries of the world.

Many things suggest sizable variations in price of health care in the different countries of the world and a differential between health care prices and the general price level of all commodities and services. There are good reasons for expecting the price level in various countries to differ significantly among commodities and services. Apart from indirect tax levies, subsidies, and selective price controls, differences in production processes and the degree of capital intensity or labor intensity of the production affect these relative prices. Health care is largely a personal service, in which labor is the largest element of cost. In the United States high prices are associated with products requiring extensive labor services, and relatively low prices are associated with products requiring much capital. In many nations, these tendencies are reversed. If the relative price of health personnel is lower in many nations than in the United States, the same ratio of health expenditures to gross national product here and abroad must mean either a larger volume of care or a higher quality of care per equivalent income abroad than in the United States.

Furthermore, prices of medical care in nations which pay their health practitioners on a fee-for-service basis may be expected to be higher than prices in countries using a per capita or sal-

Dr. Mushkin, economic consultant with the Division of Higher Education, Office of Education, prepared this paper for the Conference of Health Economists held in San Francisco on November 3, 1960.

aried arrangement. If, despite differences in methods of remuneration, expenditures are the same proportion of total resources, again there still must be compensating volume or quality differences. On a somewhat different plane, we know of these price differences through the number of our foreign visitors who return to their country of origin when illness strikes because of relative differences in price of care.

A beginning of research on comparative prices has been made in the Gilbert studies on international comparisons of national products (4,5). His studies and similar studies on international comparisons of gross product estimates have revived, in a sense, the original purposes of price indexes, that is, to show differences in the value of money in the different countries. While there have been many studies over a long period and by very eminent economic scholars, including Marshall, Jevons, Mitchell, and Keynes, on construction of price indexes for measuring comparative general price levels, very little attention has been directed to comparisons of prices of health care and of its component products and services.

The Gilbert studies include health care whether provided publicly or privately as an item of personal consumption in the gross expenditure accounts of the countries studied. The procedure, in brief, followed that of defining a market basket of health goods and services, of ascertaining quantities and prices of the items in this basket in one country compared with quantities and prices in another, and of obtaining the weighted average for the European countries compared with the United States. For purposes of this analysis, European market prices have been converted into dollars at the purchasing power equivalents for consumption of all commodities and services and then expressed as a ratio of United States market prices. For purposes of illustrating the procedure, we assume that "health care" in the United States costs \$1, and in a foreign currency, five currency units. At the same time it requires 10 units of the foreign currency to buy the same amount of all goods and services combined as could be bought with \$1 in the United States. In this example, then, "health care" would be one-half as expensive in the European country as in the United States.

The findings indicate:

- Health care was relatively cheaper in the eight countries studied than in the United States. Taking prices in the United States as 100, the relative market prices of health services and goods in these countries in 1950 were:

Denmark.....	59	France.....	61
United Kingdom....	72	Netherlands.....	63
Norway.....	55	Germany.....	55
Belgium.....	71	Italy.....	54

SOURCE: Reference 4, p. 62.

- Health care, when uniformly valued at average European prices, was a smaller part of consumption of commodities and services in the United States than in most European countries. Health expenditures valued in this way accounted for 3.4 percent of consumption in the United States, 5.1 percent in Norway, and 5.5 percent in Western Germany.

- The per capita gross product represented by health care items was higher in the United States than in other countries studied. At the United States relative price weights in dollars, the per capita gross product represented by health care items was \$71 in the United States compared with Norway's \$60, the highest figure for the European nations. For the eight countries studied, relative price weights in dollars for gross consumption of health goods and services in 1950 were:

Denmark.....	\$54	France.....	\$40
United Kingdom....	49	Netherlands.....	37
Norway.....	60	Germany.....	40
Belgium.....	47	Italy.....	7

SOURCE: Reference 4, p. 75.

- Variations in quantities of health care consumed were largely explained by differences in total consumption in the countries or by differences in price. Eighty-nine percent of the variation was explainable by either total consumption or price differences.

- The consumption elasticity for health care was less than unity, suggesting, in general, that the proportion of expenditures for health care declines as income increases.

In terms of assessing the meaning of expenditure differences and similarities, the Gilbert type of study is far more useful than comparisons among nations based wholly or in large part on some ratio to gross product. It is more

useful than the more refined types of ratios, such as the ratio of health expenditures per family to some representative wage level or of health expenditures per capita to income per wage earner.

The indexes of the Gilbert studies are also subject to criticism apart from problems of defining a reasonably equivalent market basket of health care. The definition of health expenditures lacked specificity; estimates of quantities and rates that took the place of comparable basic data were very crudely designed. Health products and services in a global study of gross national product, while significant, are a relatively small part of the total. Given problems of penetrating through much incomparable data on outlays, in the aggregate and by type, of effectively using utilization rates for health services as measures of quantity, and of applying such rudimentary information as exists on quality differences, a more precise type of analysis is probably outside the feasible time schedule of the economist working on a general economic problem, such as comparisons of gross national product. What is required is a careful formulation of an equivalent market basket of health services and goods in European countries and in similar industrial nations and a collection of data on quantity, quality, and price of these services. The International Social Security Association has made a small beginning on at least part of the problem (6, 7). However, much remains to be done. The work carried forward by those in the health field can then be used by the generalist as part of his analysis of aggregate consumption and purchasing power equivalents.

When we turn our attention to the problem of prices and quantities of health services in the underdeveloped countries of the world, the complexities of measurement are increased many times over. Industrial nations have brought the infectious and contagious diseases under an important and impressive measure of control. Their primary health problems lie in the areas of curative medicine and chronic diseases. The underdeveloped nations, however, are still plagued by mass contagious and infectious diseases. In many of these nations life expectancy at birth is still close to 30 years, whereas in the industrial nations, life expectancy is more

than twice as long, approaching 70 years. We need to carefully assess expenditure items which are equivalent, given the wide differences in mortality and morbidity in the industrial and nonindustrial nations. The health measures required for control of mass diseases are generally less costly and extensive than curative medicine. Drugs and sanitation lie at the core of public health in underdeveloped nations. While marked improvement in sanitation can be achieved by using the resources within the country, sanitation programs require considerable capital in countries in which investment funds are scarce. Drugs, moreover, often are not produced within the nations subject to these infectious and contagious diseases, and purchases are made at world market prices.

Summary

For the industrially developed countries, a reasonably equivalent "market basket" or package of health services and their commodity components can be defined and priced. But it will take a carefully designed study not only of prices of health services and commodities but of general price levels to yield useful results. For the nations emerging into an industrial world, a proper base for comparisons of health prices requires definition. Certainly, a beginning can be made by formulating a "package of preventive public health programs" to control the mass diseases and by pricing these services.

Much additional work remains to be done to develop intercountry comparisons of use of health services and of prices of these goods and services before expenditure differences can be assessed. Along with such studies a careful collection of data on expenditures for health care in the different countries is needed. The World Health Organization has undertaken to collect these data in conformance with carefully worked through definitions.

Two methods have been used to make intercountry comparisons of the economic resources devoted to health care. Percentages of gross national product represented by health expenditures have been computed to show the shares of economic resources devoted to health in a number of countries. The estimates of gross na-

tional product and the health services component of these products have been adjusted for price differences before computing shares in the different countries.

The Gilbert study, which follows the second of these methods, points up differences among nations in the shares of economic resources devoted to health; the approach of the International Labor Office and the World Health Organization suggests uniform allocation of resources for health.

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National Dental Health Center

The National Dental Health Center, opened by the Public Health Service in San Francisco on July 1, 1961, provides facilities for applied research in prevention and control of dental diseases and for training in application of research findings.

Activities of the new center are intended to reduce the timelag between the discovery of new knowledge and techniques and their subsequent use in dental health programs.

Among initial projects will be the investigation of the epidemiology of periodontal disease and a study of factors associated with the occurrence of cleft lip and palate. Demonstrations and training courses will be aimed at furthering the skills, knowledge, and information of State and local health agency personnel, dental educators, and private practitioners.

The center, located on the grounds of the Public Health Service Hospital and operated by the Division of Dental Public Health and Resources, will have a staff of 20 for the first year. Dr. George Nevitt is director of the center and its training activities. Dr. John Green heads the epidemiology program.

Determinants and Consequences of Mortality Trends in Ceylon

HARALD FREDERIKSEN, M.D., M.P.H., D.T.M.&H.

THE DEATH RATE in Ceylon declined from 19.8 to 14.0 per 1,000, or 29 percent, in the year from 1946 to 1947. Being most abrupt, this decline in the death rate has given rise to postulations that advances in public health techniques permit significant reductions in the death rate, independently of economic development. Thus, the application of public health measures would increase the rate of population growth and thereby reduce the per capita income, assuming that the birth rate remains constant and economic development lags. Frequently cited (1-5), such postulations may have been accepted as descriptive of the relationship between health and economic development in underdeveloped areas. However, these hypothetical determinants and consequences of mortality trends in Ceylon are not confirmed by the sequence of events.

It was once accepted that control of malaria, through the application of insecticides, was primarily responsible for the postwar reduction in the death rate in Ceylon. This conclusion is not confirmed by the findings that the most precipitous decline in mortality had preceded large-scale application of insecticides and that the decline in mortality in the malarious area and the unprotected, nonmalarious area of the island had been about the same (6). Indeed, the net demographic effect of malaria control, which has made a major part of the island habitable, may be a reduction in population pressure.

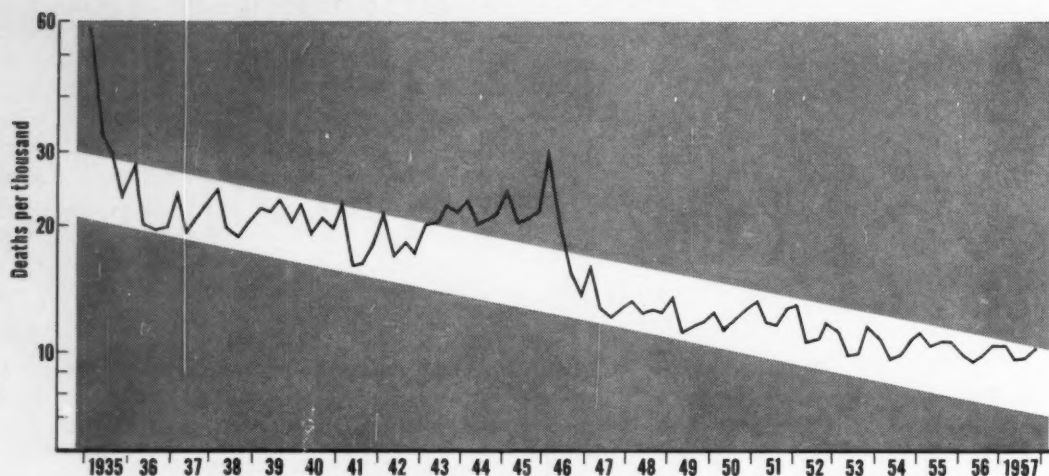
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The death rate of Ceylon has displayed a long-term downtrend, despite a step-by-step improvement in the reporting of deaths. The downtrend was interrupted in 1935, when a disastrous drought resulted in a sharp rise in mortality. A semilogarithmic plot of the death rates for the quarters of the years since the great drought in 1935 through 1957 indicates a fairly constant rate of decline in the quarterly death rates, with a wartime interruption of the downtrend and a postwar return to the prewar downtrend (fig. 1). It seems the wartime rise in mortality, rather than the postwar decline, may have been the notable event.

The wartime rise in mortality suggests that circumstances arising from the war may have exacerbated one of the major public health problems. Malnutrition and malaria have been ranked as the two foremost health problems in Ceylon. Having ruled out malaria control as the primary cause of the postwar decline in mortality, the level of nutrition was examined for fluctuations which may have influenced the death rates to rise during the war and return to the long-term downtrend following the war.

It was found that the wartime rise from 1943 to 1946 and the postwar decline in the death rate were associated with the development and alleviation of a wartime food deficit (table 1). The timing and extent of the deficit are indicated by the wartime decline in food imports which represented the principal source of food for Ceylon. The existence of reserves might have delayed any significant effects of the decline in food imports until 1943. Following the war, food imports rose and by 1947 exceeded

Figure 1. Death rates by quarter, Ceylon, 1935-57



SOURCES: Reports of the Registrar General on Vital Statistics, Ceylon.

the prewar level. The extent of wartime malnutrition and postwar recovery is indicated by the significant increase in weights of school children between 1945 and 1950 (table 2).

Although extraordinary events, such as drought or war, have been accompanied by marked deviations from the long-term trend of the death rates, attempts to isolate and measure the effects of specific causes of death or specific measures of survival on the trend of the death rates may be futile or fallacious, at least until the reporting of specific causes of death and indices of economic development provide more specific, accurate, complete, and comparable data. Since data are lacking to exclude the effects of all other factors, the precise or even relative importance of the wartime food shortage as a cause of death can not be conclusively established. Nevertheless, the available data

support consideration of malnutrition as a factor in the wartime rise in the death rate.

The relationship between mortality trends and level of living, at least in the phase of

Table 1. Mortality rates, governmental health expenditures, and imports of food and other consumption goods, Ceylon, 1938-47

Year	Mortality rate per 1,000 ¹	Per capita imports at 1938 prices ²		Per capita governmental health expenditures at 1938 prices (rupees) ³
		Food (rupees)	Other consumption goods (rupees)	
1938-----	21.0	17.6	7.8	2.2
1939-----	21.8	18.4	7.5	2.1
1940-----	20.6	17.2	7.7	2.0
1941-----	18.3	17.0	6.5	1.9
1942-----	18.1	13.8	4.5	1.5
1943-----	20.8	13.7	5.6	1.3
1944-----	20.8	15.8	6.5	1.5
1945-----	21.5	15.5	6.9	1.5
1946-----	19.8	16.6	6.6	1.9
1947-----	14.0	19.0	7.4	2.2

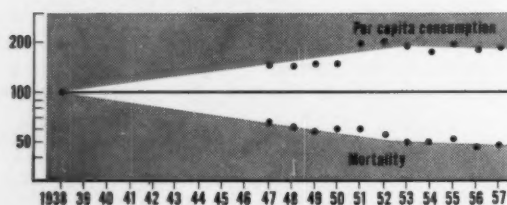
¹ Provisional corrections in the population estimates and rates for 1941 and subsequent years have been made for underenumeration of children in the 1946 and 1953 censuses.

² As computed by the Ministry of Finance.

³ Based on the cost of living index.

SOURCES: Ministry of Finance, Economic and Social Development, 1926-1954, Ceylon, July 1955, and Reports of the Registrar General on Vital Statistics, Ceylon, and Statistical Abstracts of Ceylon.

Figure 2. Indices of personal consumption per capita at 1938 prices and mortality rates, Ceylon, 1947-57 (1938=100)



SOURCE: Table 4.

Table 2. Average weights (pounds) of boys and girls, Ceylon, 1945 and 1950 ¹

Age (years)	Boys		Girls	
	1945	1950	1945	1950
6.....	35	38	34	37
7.....	39	40	38	39
8.....	42	44	41	43
9.....	46	47	45	47
10.....	48	52	48	52
11.....	51	55	52	57
12.....	53	59	56	63
13.....	61	66	65	72
14.....	64	75	70	79
15.....	74	84	81	88
16.....	80	92	87	90
17.....	86	101	89	94
18.....	93	107	92	95

¹ Based on surveys of schools in representative areas of the island.

SOURCE: Administration Reports of the Director of Health Services, Ceylon.

transition in Ceylon, may be indicated by a comparison of the trend of mortality and the per capita allocation of gross national product for personal consumption at constant prices. Although comparable data are lacking for the war years, it is evident that personal consumption and mortality rates have displayed an inverse association (fig. 2).

Improvements in the whole range of economic indices were more or less concurrent with the

decline in the death rate (tables 3, 4, and 5). Comparisons of the direction and timing of changes in economic indices suggest sectors that have been leading or lagging in the transition (table 4). Thus, in 1947, when the death rate had returned from a wartime peak to the previous downtrend, per capita consumption at constant prices had risen sharply above the level of 1938, whereas per capita health expenditures had remained at the level of 1938. In subsequent years, per capita health expenditures and personal consumption rose concurrently with the decline in the death rate. Moreover, as remittances abroad were curtailed, the rate of capital formation was increased to a remarkable extent (table 5). Capital formation at the rate of 12 and 13 percent of the gross national product exceeds the rate of investment in most underdeveloped countries and compares favorably with that in Europe.

If the sequence of events in Ceylon had demonstrated that economic development is no longer a prerequisite for a decline in the death rate, it might have seemed plausible to postulate that modern public health measures would tend to reduce per capita income as well as mortality, with the possible inference that per capita income would rise with a rise in mortality. But the postulation of such consequences of mortality trends is not confirmed by the experience of Ceylon, where a decline in

Table 3. Gross national product, Ceylon, 1938 and 1947-57

Year	Gross national product at current prices (millions of rupees)	Cost of living index (1938=100)	Gross national product at 1938 prices ¹ (millions of rupees)	Population (thousands)	Gross national product per capita at 1938 prices ¹ (rupees)	Index of gross national product per capita at 1938 prices ¹ (1938=100)
1938.....	656	100	656	5, 826	113	100
1947.....	2, 409	252	956	7, 044	136	120
1948.....	2, 762	260	1, 062	7, 251	146	129
1949.....	2, 967	258	1, 111	7, 476	149	132
1950.....	3, 501	272	1, 287	7, 688	167	148
1951.....	4, 619	283	1, 632	7, 885	207	183
1952.....	4, 507	281	1, 604	8, 088	198	175
1953.....	4, 491	286	1, 570	8, 302	189	167
1954.....	4, 748	284	1, 672	8, 519	196	173
1955.....	5, 234	282	1, 856	8, 729	213	188
1956.....	5, 096	281	1, 814	8, 945	203	180
1957.....	5, 200	289	1, 799	9, 172	196	173

¹ Based on the cost of living index.

SOURCE: Statistical Abstracts of Ceylon.

mortality has been associated with development of the economy and rise in the level of living.

The question remains whether a decline in the birth rate will follow the rise in the level of living and the decline in the death rate or whether there will be a fundamental difference in the interaction of economic and demographic transition in Ceylon and the West. In the course of Western civilization, a decline in mortality has been observed as a concomitant of the rise in per capita income and as a precursor of the decline in the birth rate (1,2,4,5). There have been some doubts whether a similar relationship between the death rates and birth rates will be observed in underdeveloped areas, where postwar reductions in mortality had been considered to be exclusively or largely the result of specific public health measures and quite independent of economic development (4,5).

The birth rate of Ceylon has declined from a postwar peak of 39.8 to 35.8 per 1,000 population in 1958, when the districts of Ceylon displayed considerable variation in the level of the birth rates. In 1958, the birth rates in the districts ranged from 53.6 to 25.4.

Data for the 21 districts of Ceylon suggest a relationship between the level of the death rates and the subsequent level of the birth rates.

Table 5. Allocation of the gross national product, by percentages, Ceylon, 1938 and 1947-57

Year	Personal consumption	Government expenditures		Remittances abroad	Capital formation	Increase or decrease in assets abroad ¹
		Health	Other			
1938	69.1	1.9	12.5	13.9	5.9	-3.4
1947	83.6	1.6	11.7	5.2	5.4	-7.5
1948	74.6	1.9	10.8	5.4	6.3	0.9
1949	73.8	2.0	11.3	4.6	9.3	-1.0
1950	69.0	1.8	10.5	5.5	9.0	4.2
1951	71.7	1.5	7.4	5.0	12.0	2.4
1952	78.5	1.9	8.6	5.2	13.5	-7.7
1953	77.0	2.0	9.9	3.8	12.4	-5.1
1954	68.4	1.9	9.4	3.6	10.5	6.1
1955	68.3	1.8	9.0	4.1	11.9	5.0
1956	68.1	2.0	11.4	4.4	13.6	0.5
1957	73.4	2.2	11.6	3.9	13.4	-4.5

¹ As percent of gross national product.

SOURCE: Statistical Abstracts of Ceylon.

Comparison of the death rates in 1938 and the birth rates in 1958 demonstrates the remarkable correlation (table 6). Low death rates or conditions underlying low death rates merit consideration as contributory factors, if not as prerequisites, for low birth rates.

At this time, the districts of Ceylon with the lowest birth rates are characterized by the great-

Table 4. Mortality and economic indices of personal consumption, health and other governmental expenditures, remittances abroad, gross capital formation, and gross national product, Ceylon, 1938 and 1947-57

Year	Mortality		Per capita indices at constant prices (1938) ¹					
	Rate per 1,000	Index	Personal consumption	Government expenditures		Remittances abroad	Gross capital formation	Gross national product
				Health	Other			
1938.....	21.0	100	100	100	100	100	100	100
1947.....	14.0	67	146	99	113	46	110	120
1948.....	13.0	62	141	130	113	51	137	129
1949.....	12.4	59	146	140	123	46	213	132
1950.....	12.4	59	149	141	125	59	225	148
1951.....	12.7	60	191	143	108	67	372	183
1952.....	11.8	56	200	171	121	67	400	175
1953.....	10.7	51	187	172	133	46	351	167
1954.....	10.2	49	173	175	131	46	309	173
1955.....	10.8	51	187	173	135	56	378	188
1956.....	9.8	47	178	186	164	57	412	180
1957.....	10.1	48	185	198	162	49	393	173

¹ Based on the cost of living index.

SOURCES: Statistical Abstracts of Ceylon and Reports of the Registrar General on Vital Statistics, Ceylon.

Table 6. Correlation between the death rates in 1938 and birth rates in 1958 in 21 districts of Ceylon

Death rates per 1,000 inhabitants	Birth rates per 1,000 women 10-49 years of age				Total districts
	90-119	120-149	150-179	180 and over	
10-19-----	5	3	0	0	8
20-29-----	2	2	2	0	6
30 and over----	0	0	3	4	7
Total districts-----	7	5	5	4	21

SOURCE: Reports of the Registrar General on Vital Statistics, Ceylon.

est density of population or urbanization, the highest literacy rates, and the highest mean age of females at marriage, as well as the lowest death rates. Reductions in the birth rate may be experienced in all districts of Ceylon as the factors underlying the low birth rates in some of the districts are extended islandwide.

The associations between economic and demographic indices suggest cause and effect relationships. However, postulation of the precise nature or direction of the causal relationships

may tend to be an oversimplification of a complex process of interaction between multiple causes and multiple effects. Improvement in one index of economic or demographic transition may tend to be associated with improvement in all indices through a process of concurrent and cumulative causation. Thus, economic and demographic transition may tend to be parts of an integral system in which arbitrary indices of welfare and well-being may be mere aspects of one underlying reality.

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UCLA School of Public Health

Graduate programs of the newly established School of Public Health at the University of California at Los Angeles will be conducted in biostatistics, environmental health, epidemiology, public health administration, general hospital and mental hospital administration, medical care administration, occupational health, public health education, and public health nutrition. The graduate degrees offered are the master of public health, master of science in public health, doctor of public health, and doctor of philosophy in biostatistics. The programs have been accredited by the American Public Health Association.

The school offers field training with public health agencies and a variety of scholarships and fellowships.

Further details are available from: Dr. L. S. Goerke, Dean, School of Public Health, University of California at Los Angeles.

Elderly Studied in Florida

A large transplanted population of elderly people, mostly white, Protestant, relatively well educated, married, and retired, with better than average incomes, characterizes St. Petersburg, Fla., and surrounding Pinellas County, according to a recent survey of the area. This survey, which covered a 3.5 percent sample of persons 65 years old or over, is the first phase of a comprehensive study of public health needs and services conducted by the county health department. Findings for the most part are corroborating the prevailing impression of this community, long known throughout the world as "a desirable place for retired persons to live."

The over-representation of the aged in Pinellas County is clearly established. The 1950 U.S. census reported that 18.8 percent of the residents were 65 years of age or over, compared with a national average in that year of 8.1 percent. (According to advance reports of the 1960 census, the proportion of persons 65 years old or older in Pinellas County was 24.9 percent.)

Distribution of the elderly population by age differs little from that estimated in the Nation in 1959. The county has, however, a greater concentration of persons from 70 to 74 years of age.

The population of Pinellas County 65 years old and over is predominantly white; less than 3 percent are nonwhite. The ratio of men to women is relatively high, with 97 men per 100 women, which contrasts sharply with the official estimate for the United States of 83 men per 100 women in the age group studied.

The educational level of Pinellas County's older people is considerably higher than that of their national counterparts. National census figures for 1952 are higher for those with no formal education and with only elementary education but lower for those who have completed 1 or more years of high school and college. Since the elderly in the county are mostly migrants from other States, it appears that interstate movement to this area has selected persons with more education.

Pinellas County's aged population appears to be better off financially than other older people in the Nation. About 14 percent had annual family incomes greater than \$5,000 for the year preceding the interview, 21 percent were paid more than \$3,000 but less than \$5,000, and 24 percent received

more than \$2,000 but less than \$3,000. More than one-tenth reported either a loss or less than \$1,000 income, and more than one-fifth received less than \$1,500.

The marital status of Pinellas County's elderly differs sharply from the national norm. Both men and women tend to a much greater extent to be married and not widowed. This suggests that long-distance migration consists mainly of married couples, and further study may indicate a tendency for a surviving spouse to leave the county.

Most of the persons studied are "retired," and are migrants from other States. Only one-tenth were engaged in paid employment: for white men the figure was less than 12 percent and for white women it was even lower. Although more than 90 percent of the men considered themselves retired, more than two-thirds of the women said they were "not retired," a reflection of their continuing function as housewives.

Most of the elderly persons in the county have spent the major share of their lives in other States. A third have been Florida residents for less than 5 years, and this proportion is probably understated because of a residence requirement for inclusion in the sample (since July 1, 1958). Nearly two-thirds have lived in the county less than 10 years, less than 1 percent are lifelong residents, and only 16 percent are residents of 20 years or more. Apparently migration often occurs at advanced ages. Of the 228 persons aged 80 through 84 more than a fifth have been residents less than 5 years, and two-fifths less than 10 years.

This pattern of migration into the county at or near retirement ages is characteristic almost exclusively of the white population. Nonwhites, principally Negroes, usually have lived in the area for long periods.

These findings are taken from a paper by Irving L. Webber, Ph.D., research social scientist, Pinellas County Health Department, St. Petersburg, given at the 10th Annual Southern Conference on Gerontology, Gainesville, Fla., March 17, 1961. The full paper is included in the report of the conference, "Aging: A Regional Appraisal," edited by Carter C. Osterbind, Ph.D., published in June by the University of Florida Press.

Use of Teenage Student Volunteers in a Local Health Department

HUNTINGTON WILLIAMS, M.D., ANN MILLER, R.N., and JOSEPH GORDON, B.S.

TEENAGE volunteers have served in the Baltimore City Health Department during the summers of 1959 and 1960. The first summer, 23 high school students and 1 college student contributed 2,550 hours of volunteer service; the second summer 28 students gave 2,070 hours of service. The supervisor of volunteers recruited the teenagers with two objectives: (a) the students would help meet certain needs during the summer when clinics are crowded and personnel are vacationing, and (b) they would be working in several areas of health and medicine, an exposure which might influence them to choose health careers. The students came from nine public high schools, one parochial school, one private school, and one college. The 1959 group included 22 girls and 2 boys; the 1960 group, 24 girls and 4 boys. Four students worked both summers.

Recruitment

Recruitment of students began in April 1959. A preliminary announcement of the summer program was published in the *Baltimore Bulletin of Education*, a journal of the public schools. The announcement was directed to vocational guidance counselors who were in key positions to inform the student bodies of individual schools of opportunities for volunteer service and certain students with particular interest in

Dr. Williams is commissioner of health of Baltimore. Miss Miller is supervisor of volunteers, and Mr. Gordon is director, bureau of health information, Baltimore City Health Department.

health work. This announcement was followed by a number of other steps. The director of volunteers of a local hospital was asked to recommend volunteers she was unable to place in the hospital. School nurses in each secondary school were notified of the plan and asked to assist by making referrals. The director of nursing of the Baltimore Regional Chapter, American Red Cross Nursing Service, and the director of a course in practical nursing were also asked to help recruit.

Finally, a followup notice was published in May in the *Baltimore Public Schools Staff Newsletter*, a publication received by every teacher in the school system. These efforts produced the names of 64 students, 33 of whom were interested enough to come to the health department for interviews. Seventeen came for the orientation period and six additional high school students and the college student volunteered at a later date.

Safeguards

All students were required to fill out an enrollment form containing general and health status information. The health checkup included a physical examination given by the Maryland State Department of Labor and Industry and a tuberculin test by the health department. Parents were also required to give written approval for their children to work in the health department.

The physical examinations given by the State department of labor and industry were required to obtain a work permit that, under the work-

man's compensation law of the State of Maryland, protects the city from double indemnity if minors are injured at work. These arrangements were decided upon after conferring with the department of labor and industry before the students began work. The students obtained the work permits without charge, and these were kept on file in the health department and returned to the State department of labor on completion of service. Since student workers performed their duties under authorization from the commissioner of health, they were considered to hold the same status as paid employees who are the legal agents of the health commissioner.

Orientation of Students and Staff

The supervisor of volunteers felt the students needed an orientation period to broaden their knowledge of the services and facilities of the health department and to create an esprit de corps within the group. At the close of the school year, one day was set aside for general orientation, including a study tour of health department facilities and the selection of assignments. A second day was devoted to teaching procedures the students would use in their work. During this period the teenagers were issued distinctive volunteer smocks which not only identified them but contributed to their feeling that they were a special group doing a special and important job. Students elected to work in the bureau of public health nursing, bureau of child hygiene, medical care section, and bureau of laboratories.

Orientation of the health department staff who would be working with the students began as soon as the program was conceived. Opportunities for student participation and aims, ideals, and methods for the program were discussed by public health nurse supervisors at their regular meetings. The supervisor of volunteers developed a fact sheet for the volunteer project which was distributed to all public health nurse supervisors approximately 2 weeks before the students reported.

In addition, the supervisor of volunteers attended staff meetings in several district health offices to discuss with the public health nurses the assets and liabilities of teenage assistants and how to plan for them.



Volunteer is instructed in the use of a binocular microscope. Students learn about new equipment and procedures they had not encountered in high school.

One person in each district office was appointed to supervise the students. In two offices a supervisor of public health nursing was made responsible; in the other four, a staff nurse was appointed.

Although students were to work in the bureau of child hygiene and the medical care section and as laboratory aides in the bureau of laboratories, no orientation of staff personnel of these particular units was considered necessary in view of the specialized nature of their activities and the close supervision the staff members would exercise as the students carried out their

Baltimore's Volunteers

In the Baltimore City Health Department, 1,001 volunteers gave 17,667 hours of service in clinics, schools, and offices during 1960. The program, now in its 7th year, is guided by a volunteers' council and administered by a supervisor of public health nursing.

duties. However, responsibility for supervision of the students was assigned to the assistant to the director in the medical care section and to the assistant director in each section in the bureau of laboratories. In the bureau of child hygiene, work was distributed without orientation according to the job.

The supervisor of volunteers assumed overall responsibility for the students. She also visited each one within the first 2 weeks of assignment.

Work Record

The student volunteers served during a 10-week period from June 29 to September 4, 1959. Each student volunteered from 1 to 5 days a week. Eighteen of the 24 completed the full schedule, and five contributed an additional week's work because they saw that the health department was busy and could use their services to good advantage.

Hours worked by student volunteers June 29, 1959-September 4, 1959

Activity and student	June	July	August	September	Total
Total hours	59	1,392	1,054	45	2,550
Laboratories	12	486	334	21	853
1	8	72	88		168
2	4	123			127
3		88	44		132
4		67	42	21	130
5		136	160		296
Well-baby clinics	28	673	660	24	1,385
6		65	65		130
7		61	44		105
8		40	32		72
9		57	44		101
10		14	54		68
11	2	75	54		131
12		57	58		115
13	2	48	56		106
14		24	32	12	68
15		24	32	12	68
16		45			45
17			55		55
18			28		28
19		42	36		78
20	12	41			53
21	12	80	70		162
Prenatal clinics			28		28
18			28		28
Clerical	19	233	32		284
22	6	94	14		114
17	9	49			58
23	4	76	18		98
24		14			14

The duties in each assignment were varied. In the well-baby clinics students weighed babies, called patients, assisted physicians, and sent out appointment cards. They conducted a play group for children waiting to see the physician in a well-baby clinic. In a prenatal clinic a student acted as registrar and sent out appointment cards.

Five students worked for the bureau of laboratories. In the chemistry laboratory they helped in weighing specimens and materials, prepared outfits for determination of lead in blood samples, tested needles for sharpness, performed tests for lead content of paint, cleaned equipment, wrote up cards, and entered information in laboratory notebooks.

They assisted in recording specimens for the serologic tests for syphilis, and in the microbiology laboratory they cleaned slides, prepared swabs and media, set up plates, and prepared specimen counters. In the supply room they prepared culture tubes and agar plates and assisted the supply clerk.

In the medical care section one student assisted with filing, coding punchcards, and miscellaneous office work (see table).

During the last week in July 1959 the volunteers evaluated the program at luncheon meetings. Their responses were constructive and thoughtful. At this time the volunteers were given an opportunity to change assignments, but only those filing poliomyelitis record cards in the bureau of child hygiene wanted to do so. Discussion centered around two main themes: their work during the summer and their future careers. The girls working in the district offices, with only three exceptions, had previously decided on careers in nursing. One of these three planned to be a physician; the other two were undecided. The prospective nurses had chosen schools and were taking the courses required for admission. All were in the top quarter of their high school class the previous year. For all of them their volunteer service was an initial contact with public health work. Students' suggestions for improvements included more opportunity to see what the nurse contributes to the public health program and to observe home visits and nurse-patient interviews. All claimed they enjoyed their work and felt they had learned a great deal.

The laboratory and clerical workers had a different reaction. They were less certain about their future careers. They saw the summer's experience as a way of finding out more about what it was like to work. Three thought they might be interested in health careers in one form or another. One girl is studying to be a laboratory technician. This group had to learn the importance of doing small tasks carefully and the difficulties of working in situations where peak loads are followed by unpredictable periods of inactivity. They were learning how to work with other people and for the most part were enjoying it. Despite the lack of strong motivation they worked conscientiously and well.

The student volunteers who worked in the health department in 1960 also met for an evaluation session. Reporting what they liked about their work, they said that the "nurses made the volunteers feel that what they were doing was helpful," and the volunteers working in the laboratories felt "they were taking a load off the laboratory workers." The teenagers listed the reasons for setting up the program as "to give assistance to different branches of the health department" and "to give the volunteer an opportunity to learn by watching and practicing."

Commenting on the program, the nurses declared that the volunteers "joined in anything, any type of work," and they "came in and worked as if they were paid." The nurses were "thankful for the work that has been done" and "wondered how they'd gotten along without the volunteers."

Problems

As a group the volunteers performed well. Misfits were few. One girl was reported for tardiness, indifference, and generally poor work. Her work improved after a conference.

One boy was an epileptic. The director of the laboratories and his staff took considerable time and thought to find a niche for him. After a stormy first week, he settled into the routine and worked conscientiously and well. He left at the end of a month to be hospitalized.

When it was feared that the quota of student volunteers would not be met, "very mature"

15-year-olds were accepted. As a group they needed more direction and support than the older students. Most did well with guidance; one girl, because of her inability to work without exact instruction for every minute of her time, was more of a liability than an asset.

Transportation was the greatest problem for most students. Volunteers could have been useful in outlying clinics, but the problem of getting them there was insurmountable in some instances. The girls were timid about going into some areas alone, and their parents didn't encourage them. At times nurses drove to the district office to call for them and returned them to the office when work was over.

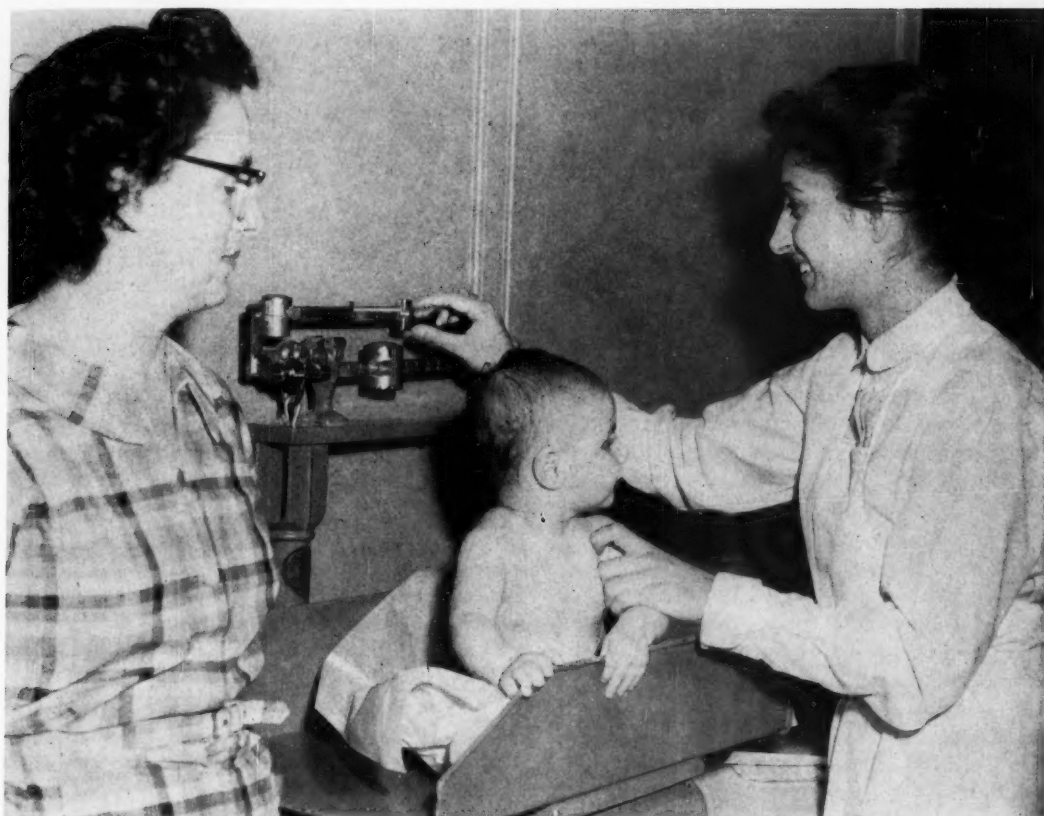
Evaluation

On the whole, staff members considered the summer student volunteer program a good project. The students had a productive and enjoyable summer, and the health department obtained many hours of service for a small expenditure of money. Excluding the salary of the supervisor of volunteers, the cash expenditure amounted to \$32.11. In addition to valuing the student services highly because of personnel shortages during vacations, the staff found they boosted morale with their energy and enthusiasm. In some instances volunteers contributed services such as the play project which the department lacked personnel and funds to conduct. It is possible that some students look with favor on a career in public health, and it is certain that the department has acquired new friends.

Some problems resulted. Participants might have been selected more carefully. Should selection always be for the best interests of the department or should students be accepted with the idea of helping them?

The age of students needs further consideration. While 16- and 17-year olds are more adaptable and need less direction than younger persons, with adequate supervision the younger student has a definite contribution to make. Prenursing aide programs are geared to 16-year-olds. Perhaps the health department can perform a real service by giving opportunities to carefully selected younger students.

Work assignments need further considera-



In well-baby clinics, the volunteers assisted public health nurses by weighing babies, acting as receptionists and clerks, and caring for equipment.

tion. The students liked the work in the bureau of laboratories and in the medical care section. It is possible that students could be more useful in office situations. Younger teenagers could work in inoculation clinics. Selected older students might enjoy working in prenatal clinics. Some tasks need to be expanded if they are to be more appealing to restless teenagers.

Public Relations

Residents of the city were fully informed of the student volunteer project through a health department release to local news outlets. In addition to short announcements in the press two feature stories, illustrated with photographs, were written by interested newspaper reporters, and a statement was broadcast by a

local radio station. The community coverage served to inform residents of health department activities and career opportunities in health.

Each participant was awarded a certificate of volunteer service and a letter of appreciation for the services they contributed. The supervisor of volunteers sponsored a picnic for the students at a nearby recreation area. A student committee planned the picnic and 11 students and a staff nurse as well as the supervisor of volunteers attended.

Summary

During the summer of 1959, 24 students contributed 2,550 hours of volunteer work to the Baltimore City Health Department. The cash outlay by the health department for the program during a 10-week period was only \$32.11.

The students were recruited largely through public school staff bulletins and personnel, the American Red Cross local chapter, and a local hospital. Both health department staff and student volunteers participated in orientation periods. Students worked in various assignments under designated supervisors in public

health nursing, child hygiene, medical care, and laboratories. Problems related to work assignments and ages of students need further study. Health department staff members considered the project valuable, and it was continued the summer of 1960, when 28 students contributed 2,070 hours of service.

Social Dynamite

The following is excerpted from an address by James B. Conant to the Conference on Unemployed Out-of-School Youth in Urban Areas, Washington, D.C., May 24-26, 1961. Dr. Conant, emeritus president of Harvard University and former ambassador to West Germany, has recently made a study of American high schools under a Carnegie grant.

In a slum section composed almost entirely of Negroes in one of our largest cities, the following situation was found: A total of 59 percent of the male youth between the ages of 16 and 21 were out of school and unemployed. They were roaming the streets. Of the boys who graduated from high school, 48 percent were unemployed in contrast to 63 percent of the boys who had dropped out of school.

In short, two-thirds of the male dropouts did not have jobs and about half of the high school graduates did not have jobs. In such a situation, a pupil may well ask, "Why bother to stay in school when graduation for half the boys opens onto a dead-end street?"

An even worse state of affairs was found in another city. In a slum area of 125,000 people, mostly Negro, roughly 70 percent of the boys and girls ages 16-21 are out of school and unemployed. . . .

I know there are those who maintain that, on the average, Negro children are inferior to white children in academic ability. I have seen no evidence to support any such contention. . . .

In an all-white slum in a city of considerable size . . . careful study of a group of children in

grade 4 of one school showed that their average achievement level was a full year below their grade placement—a typical situation in any slum area. . . .

The task with which the school people must struggle in the city slum is, on the one hand, how to prepare the youth for getting and keeping a job as soon as he or she leaves school and, on the other hand, to encourage those who have academic talent to aim at a profession through higher education. The task thus stated seems simple. In fact, as you all know, the difficulties are enormous. . . .

One teacher said to me, "We do quite well with these children in the lower grades. Each of us is, for the few hours of the school day, an acceptable substitute for the mother. But when they reach about 10, 11, or 12 years of age, we lose them. At that time, the 'street' takes over." . . .

What can be done to offset the demoralizing attitude of "the street" in the worst of the slums? Not much that lies within the province of the school authorities alone. Here is where the social agency people, the juvenile court people, the churches come into the picture. . . .

The situation in which a boy drops out of school only to roam the streets is quite different from the situation in which a boy drops out and finds satisfactory employment. Full-time schooling for certain youths through grade 12 may be good or bad depending upon the employment picture. What goes on in the school ought to be conditioned in large measure by the nature of the families being served, the vocational plans and aspirations of the students, and employment opportunities.

MINAMATA DISEASE

Since 1953, 83 cases of a severe neurological disorder have occurred among residents living in the vicinity of Minamata Bay, Japan. The case fatality rate has been about 30 percent, and most of the surviving patients have been left with severe permanent neurological and mental disabilities.

The onset of the illness, now known as Minamata disease, is acute or subacute and has usually been characterized by peripheral and circumoral paresthesia, ataxia, dysarthria, and dysphagia. Further damage to the central nervous system is manifested by confusion or other disturbances of mental function, constriction of visual fields, deafness, and motor system abnormalities including involuntary movements. Diffuse neuronal degeneration has been demonstrated pathologically, and cellular loss in the granular cell layer of the cerebellum has been a particularly constant finding. There has been no essential difference in incidence by sex, and persons of all ages other than nursing children have been affected.

After early Japanese investigations noted that household cats and sea birds were also affected, a relationship between the eating of seafood from Minamata Bay and the occurrence of this illness was established. The effluent emptied into the bay from a large chemical manufacturing plant was considered as a possible source of seafood contamination. Evidence incriminating an organic mercury compound from the plant as the cause of the outbreak included the following:

- High concentrations of mercury were found in mud and shellfish from Minamata Bay, with maximum values in specimens taken near the outlet of the factory's effluent channel and diminishing concentra-

tions in specimens taken at increasing distances from the outlet.

- By autopsy, mercury was found consistently in brains and other organs of patients and cats dying with this disease.

- Shellfish from the bay or purified organic (alkyl) mercury compounds fed to laboratory cats produced an illness which was clinically and pathologically indistinguishable from that in the spontaneously affected house cats in Minamata.

- The disease in the Minamata area presented striking similarities in clinical and pathological features to human organic mercury poisoning reported from diverse sources.

At the Minamata chemical plant, mercuric chloride is used as a catalyst in making vinyl chloride, for which the annual production increased from 60 tons in 1949 to 18,000 tons in 1959. An estimated 60 grams of mercury are lost in the wash for each ton of vinyl chloride produced, and approximately equal amounts of mercury are removed from the reactors as spent catalyst. Whether some of the mercury from the reactors may also have found its way into the bay during the early years of vinyl production is uncertain.

About 1950, the effluent which had formerly emptied from the factory into the sea was diverted into a new channel opening directly into Minamata Bay.

Minamata disease conforms to the recognized features of organic mercury intoxication whereas inorganic and highly dissociated mercury compounds cause symptoms of damage primarily at sites of absorption and excretion. Therefore, mercury in the Minamata area is presumably discharged into the bay in an organic form, or it is converted into this form by simple marine life or by the biological species which also serve as its vehicle. Organic mercury compounds tend to be bound to red blood

cells and are carried in the circulation for longer periods than are inorganic forms which are associated with the plasma fraction. This may afford greater opportunities for organic mercury to affect diverse organ systems, such as the brain, and a selective permeability of the blood-brain barrier may exist as well.

A review of the world literature on organic mercury intoxication indicates that poisonings have occurred mainly in laboratory workers, industrial personnel, or farmers producing organic fungicides or using them on seeds. To date, no outbreaks similar to that in Minamata have been reported. Since mercury is widely used in the production of vinyl chloride, some studies were conducted to assess its toxic role elsewhere.

Large amounts of vinyl chloride are produced near Galveston Bay, Tex. With one exception, shellfish and mud taken from Galveston Bay in the vicinity of factories producing vinyl chloride contained no appreciable amounts of mercury compared with specimens from a control area in the Chesapeake Bay. Mud from one area of Galveston Bay, adjacent to a holding basin where spent catalyst had been dumped, contained 12.5 ppm of mercury. Mud from diverse locations in Minamata Bay had contained mercury varying from 12 to more than 2,000 ppm, and in shellfish from Minamata Bay concentrations ranged from 27 to 102 ppm. Several neurologists in Galveston and Houston were consulted, but none could recall having seen any patients with illnesses suggestive of Minamata disease. A difference in methods of production may account for the general lack of appreciable quantities of mercury in mud or shellfish from Galveston Bay. Texas plants distill rather than wash crude vinyl chloride and otherwise employ

different processes. Dilution factors, the ecology of local marine life, and the dependence on local fish for food among the inhabitants of the Galveston and Minamata Bay areas also differ and could be factors in the differential incidence of the disease.

Since mercury compounds are volatile at distillation temperatures, air pollution studies were carried

out in Texas City. Mercury was found in the vicinity of the vinyl plants, but it was below the concentrations considered dangerous.

Recommendations for further studies on unknown features of organic mercury poisoning as well as for possible alleviation of the persisting toxic hazard in the Minamata Bay area have been presented

in the paper "Minamata Disease" published in *World Neurology*, November 1960, pp. 377-395.—LEONARD T. KURLAND, M.D., Dr.P.H., *National Institute of Neurological Diseases and Blindness, Public Health Service*, STANLEY N. FARO, M.D., *University of California Hospital Eye Clinic, San Francisco*, HOWARD SIEDLER, M.D., *neurological unit, Boston City Hospital*.

Health Hazards in Uranium Mines

An excessive number of deaths caused by lung cancer and complications of silicosis among uranium mine workers was disclosed at a conference of Governors and their representatives from seven uranium-mining States in December 1960. Proceedings of the conference, recently published by the Public Health Service, provide details on the health status of uranium miners and urge more aggressive action to control radiation hazards.

Since 1950, the Public Health Service, the Atomic Energy Commission, and the cooperating States have examined a total of 3,317 uranium miners. Among 907 white miners from this group who had more than 3 years of underground experience, there were three statistically significant causes of death: heart disease with cor pulmonale, up to 17.8 times the expected rate; respiratory cancer, nearly 5 times as many as usually expected; and nonautomobile accidents, about $4\frac{1}{2}$ times the anticipated number.

In 1957 the triennial medical examinations for the first time included cytological analysis of sputum for cancer cells. Of the 1,075 miners examined, 1,061 were classified negative; 13, or 1.2 percent, were doubtful; and 1, or 0.09 percent, was positive. In 1960, 1,788 miners were examined with the same technique. The first 272 reports showed the sputum from 230 miners was negative; from 33, or 12.2 percent, doubtful; and from 9, or 3.3 percent, positive.

Increases from 1957 to 1960 in the doubtful and positive categories cannot be explained by variations in the examination technique. Their ultimate significance remains to be determined. In other groups examined with this technique, persons whose specimens were positive had at least an 80 percent

probability of having bronchogenic carcinoma. The probability for those with doubtful specimens is considerably less, from 20 to 60 percent. Health officers have emphasized the importance of careful followup of men submitting positive specimens.

In 1959, 371 underground mines with 3,619 miners were studied to evaluate the extent of the radiation hazard. Thirty-three percent of the 1,802 samples taken from the mine atmosphere had concentrations less than 1 times the working level (the amount of radiation exposure which it is thought may be maintained over a working lifetime without causing biological damage); 22 percent had between 1 and 3 times the working level; 23 percent had between 3 and 9 times the working level, an increase of 2 percent more than in 1958; and 22 percent, 4 percent more than in 1958, had concentrations of more than 10 times the working level.

It is believed that radioactive contamination in most of the nearly 1,000 active underground uranium mines in the western United States can be controlled. The means of control applicable to each mine can be determined only by individual study. Continuous investigations are being made to spur compliance with measures to control radiation exposures in the mines. Upon request, various agencies of the Federal Government are ready to assist the States in carrying out their responsibilities.

Copies of the proceedings, "Governors' Conference on Health Hazards in Uranium Mines—A Summary Report," PHS Publication No. 843, may be obtained free from the Office of Information, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington 25, D.C.

Staphylococcus aureus in Domestic Animals

S. M. MORRISON, Ph.D., J. F. FAIR, B.S., and K. K. KENNEDY, M.S.

REAIZATION of the significance of staphylococci as pathogenic organisms for humans has increased greatly in the past few years. This has been largely due to the emergence of antibiotic-resistant strains; hospitals have experienced, and are continuing to experience, increased numbers of suppurative staphylococcal infections in nurseries, maternity wards, and surgical units. In numerous cases the incidence of these infections has reached epidemic proportions (1). The severity of hospital infections, as well as the apparent ease of dissemination of antibiotic-resistant *Staphylococcus aureus* within hospitals has led to studies relating to the spread of these organisms to the community at large. Discharged hospital patients and hospital employees, such as nurses, have been regarded as the primary source of dissemination of infection to the community (2). This conclusion has been reached as a result of studies dealing with the incidence of staphylococcal infections in families which have had some member hospitalized (1). Studies have also been made to determine if members of similarly situated families may become carriers of so-called hospital types of staphylococci. Most of these studies indicate that discharged hospital patients may transmit co-

agulase-positive, antibiotic-resistant *Staphylococcus* having phage types identical to those found in hospital outbreaks and epidemics. Although this seems to be the most feasible route of transmission to the community at large, there exists no evidence which limits transmission of these organisms to this route.

In 1947 Foggie (3) published a report on the carriage of coagulase-positive *Staphylococcus* by a herd of lambs in Scotland. He found that coagulase-positive organisms could be isolated quite readily from the mouth, nose, and vagina of the animals. Gustafson and Svehag in 1956 isolated 259 coagulase-positive organisms from a group of 292 dogs suffering from otitis externa (4). The antibiotic resistance of these organisms to penicillin, streptomycin, and terramycin was less than 5 percent. However, with 33 nonpathogenic strains the percentage of resistance was considerably greater; 36 percent in the case of terramycin. Also in 1956, Rountree, Freeman, and Johnston (5) published a report of their findings in a study of nasal carriage of *Staphylococcus* by domestic and laboratory animals. They found that 11.5 percent of the dogs studied carried coagulase-positive organisms, and that among the typable cultures were to be found the so-called human types. In 1959, Mann (6) surveyed 100 dogs and 100 cats and found that 23 percent of the dogs and 7 percent of the cats harbored coagulase-positive staphylococci. Mann was successful in typing only two of the coagulase-positive cultures with "human phages." Pagano and co-workers (7) reported that they were able to isolate coagulase-positive staphylococci from 45 of 137 animals being studied in a veterinary clinic, the greatest percentage of the isolations being from dogs. Ten percent of the isolations were of

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phage type 80/81, the *Staphylococcus* strain which has been termed the "hospital type."

Rajulu and associates (8) have reported a high incidence of staphylococci in canines visiting the Kansas State University Veterinary Hospital. Of 32 dogs that were examined, 88 percent were found to carry coagulase-positive strains.

The investigation reported here was initiated to study domestic animals as another possible focal source of transmission of potentially pathogenic antibiotic-resistant, coagulase-positive *S. aureus*. It is a portion of a broader epidemiologic study currently in progress at the Colorado State University Veterinary Clinic.

Materials and Methods

Animals used in this survey (canine, feline, bovine, and equine) were from the wards of the veterinary clinic. Samples were obtained with dry swabs from the anterior nares of the test animals, and by swabbing the dorsal and lateral

surfaces of the thoracic region with sterile cotton swabs moistened in sterile physiological saline.

Primary isolation of nasal samples was made on blood agar (tryptose agar base plus citrated human whole blood) followed by subculture of growth on mannitol salt agar (Difco) and then transfer to nutrient agar slants, from which gram stains were made. Once the morphological purity of the cultures was established, the slants were stored at refrigerator temperature until further use in coagulase and antibiotic sensitivity testing.

Primary isolation of skin samples was made on mannitol salt agar. This variation in the isolation procedure described above was found desirable in order to reduce the amount of contamination due to spreading *Bacillus* species, a problem which was not encountered with nasal samples. Subcultures of skin samples were then made on blood agar, and the above described protocol was followed. All cultures were incubated aerobically for 24 hours at 37°C.

Coagulase testing was made by the tube

Table 1. Staphylococci isolated from animals in Colorado State University Veterinary Clinic, Fort Collins, Colo.

	Percent- ages based on—	Canine				Other ¹				Total			
		Nares		Skin		Nares		Skin		Nares		Skin	
		Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
a. Samples taken.....	-----	153	100.0	58	100.0	92	100.0	59	100.0	245	100.0	117	100.0
b. Isolations.....	b/a	140	91.5	39	67.2	79	85.9	50	84.7	219	89.4	89	76.1
c. Coagulase-positive.....	c/b	95	67.8	23	59.0	28	35.4	9	18.0	123	56.1	32	36.0
d. Coagulase-negative.....	d/b	45	32.2	16	41.0	51	64.6	41	82.0	96	43.9	57	64.0
e. Coagulase-positive, beta hemolytic.....	e/c	53	55.8	10	43.5	9	32.1	2	22.2	62	50.4	12	37.5
f. Coagulase-positive, nonhemolytic.....	f/c	42	44.2	13	56.5	19	67.9	7	77.8	61	49.6	20	62.5
g. Coagulase-negative, beta hemolytic.....	g/d	29	64.5	8	50.0	7	13.7	9	22.0	36	37.5	17	29.8
h. Coagulase-negative, nonhemolytic.....	h/d	16	35.5	8	50.0	44	86.3	32	78.0	60	62.5	40	70.2
i. Coagulase-positive, mannitol-positive.....	i/c	38	40.0	14	60.9	26	92.9	7	77.8	64	52.0	21	62.5
j. Coagulase-positive, mannitol-negative.....	j/c	57	60.0	9	39.1	2	7.1	2	22.2	59	48.0	11	37.5
k. Coagulase-negative, mannitol-positive.....	k/d	13	28.9	7	43.8	41	80.4	31	75.6	54	56.3	38	66.7
l. Coagulase-negative, mannitol-negative.....	l/d	32	71.1	9	56.2	10	19.6	10	24.4	42	43.7	19	33.3

¹ Feline, bovine, and equine.

Table 2. Antibiotic resistance of coagulase-positive *Staphylococcus* cultures from animals at Colorado State University Veterinary Clinic, Fort Collins, Colo.

Antibiotic ¹ and concentration used ²	Canine				Other ³		Total			
	Nares		Skin		Nares	Skin	Nares		Skin	
	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Num- ber	Num- ber	Per- cent	Num- ber	Per- cent
Coagulase-positive cultures	95	100.0	23	100.0	28	9	123	100.0	32	100.0
Penicillin (2 units)	69	72.6	19	82.6	12	2	81	65.8	21	65.6
Dihydrostreptomycin (2 µg.)	56	58.9	17	73.9	14	3	70	56.9	20	62.5
Chloromycetin (5 µg.)	5	5.3	0	.0	4	1	9	7.3	1	3.1
Erythromycin (2 µg.)	4	4.2	0	.0	9	1	13	10.6	1	3.1
Novobiocin (5 µg.)	3	3.2	0	.0	8	0	11	8.9	0	.0
Terramycin (5 µg.)	45	47.4	16	69.6	13	2	58	47.1	18	56.2

¹ 3 other antibiotics (neomycin, 5 µg.; carbomycin, 2 µg.; and ristocetin, 5 µg.) were used in the survey but are not included in this table; only 1 culture was resistant to each of these antibiotics.

² BBL Sensi-disc.

³ Numbers too small to give significant percentages.

method (9) with freshly drawn, citrated rabbit plasma, initially diluted 1:4 in sterile buffered physiological saline. One-half milliliter of the diluted plasma was added to 0.5 ml. of nutrient broth (final plasma dilution 1:8) which had been previously inoculated with the test organism. Known coagulase-positive and coagulase-negative staphylococci and plasma controls were included in each group of tests. All tubes were incubated at 37°C. for 24 hours before final reading. No attempt was made to differentiate weak and strong coagulase producers; any visible degree of coagulation was recorded as a positive test.

Antibiotic sensitivity testing of the coagulase-positive cultures was on blood agar plates. Eight Baltimore Biological Laboratories (BBL) Sensi-discs (penicillin 5 units, dihydrostreptomycin 2 µg., chloromycetin 5 µg., erythromycin 2 µg., neomycin 5 µg., novobiocin 5 µg., terramycin 5 µg., carbomycin 2 µg.) were applied simultaneously to each plate using a BBL Sensi-disc applicator. A ninth disk (ristocetin 5 µg.) was applied manually. All disks were applied immediately after uniformly inoculating the agar surface with the test organism, and all plates were incubated aerobically at 37°C. for 24 hours before reading. Since only one concentration of each antibiotic was used, reactions were recorded only as being

sensitive or resistant, sensitivity being characterized by a well-defined clear zone of inhibition.

Phage typing was performed by the staff of the New Mexico State Public Health Laboratory at Albuquerque. A basic set of 22 phages was used at the critical test dilution (CTD), and cultures that were untypable at the CTD were rechecked with phages at 10 times the CTD before reporting them as untypable.

Results

Eighty-nine percent of all the animals sampled yielded cultures of staphylococci from the nose. Fifty-six percent of the total nasal isolants were coagulase-positive by the tube method (table 1). Fewer coagulase-positive isolants were obtained from the skin of the animals surveyed. Both the canine and feline species demonstrated high carrier rates of coagulase-positive *Staphylococcus* on the skin as well as in the nose; the bovine and equine samples yielded staphylococci in high proportion from the nose and skin; however, the majority of these isolants were coagulase-negative.

The ability to produce coagulase and the ability to produce hemolysis on blood agar were compared (table 1). The number of hemolysin-positive and the number of hemolysin-negative

cultures among all the coagulase-positive organisms were similar. The cultures from the most thoroughly studied species, the canine, demonstrated this equal division as an individual group. The other species demonstrated a greater percentage of nonhemolytic, coagulase-positive nasal isolants. Likewise, coagulase-positive organisms isolated from samples obtained by swabbing the skin were nonhemolytic for all species in well over half the cases. Sixty-four percent of the coagulase-negative nasal isolants from the canine were able to produce beta hemolysis on human blood agar. The other coagulase-negative nasal isolants were in general nonhemolytic.

A comparison of coagulase reaction and the ability to ferment mannitol showed, in the coagulase-positive nasal cultures from all species, almost equal division between mannitol fermenters and nonfermenters.

Coagulase-positive nasal and skin *Staphylococcus* in the canine and feline species showed marked resistance to penicillin, dihydrostreptomycin, and terramycin at the concentrations used (table 2). Bovine and equine skin isolants showed less resistance to these antibiotics.

The majority of coagulase-positive animal cultures were insensitive to the action of human typing phages; skin isolants were remarkably refractive to their action, with only 2 of 32 being successfully typed (table 3). Four strains were obtained which were sensitive to phages 80 and 81. No correlation could be established between the phage type of an organism and its resistance to a given set of antibiotics.

Discussion

On the basis of our survey, it is obvious that the incidence of staphylococci in some domestic animals is quite high. Coagulase-positive *Staphylococcus* was readily obtained from the anterior nares and the skin surfaces of the canine and feline subjects. The bovine and equine test animals appeared to be less important as carriers of these organisms. Our experimental results verify the information published by two other groups of workers (7, 8), within limits of variation perhaps attributable to difference in sample size.

Pathogenic staphylococci have long been characterized by the production of coagulase,

Table 3. Susceptibility of animal *Staphylococcus* isolants to human typing phages

Phage	Nares	Skin
Types.....	21	2
Miscellaneous ¹	17	2
42D.....	0	0
80/81.....	4	0
Untypable.....	102	30

¹ Lytic group—I (29, 52, 52A, 78, 80), II (3A, 3B, 3C, 55, 71), III (6, 7, 42E, 47, 54, 73, 75, 77), miscellaneous (81); multiple groups—II and III, III and miscellaneous.

fermentation of mannitol, and production of hemolysins. This characterization has come about as the result of observations on isolants from infections known to be caused by *Staphylococcus*. The relationships among these characteristics are unfortunately obscure, and the validity of hemolysin production and mannitol fermentation as indicators of potential pathogenicity has yet to be firmly established. At present, the production of coagulase is generally accepted as the best indicator of pathogenic potential. Our results did not demonstrate any degree of relationship between the production of coagulase by animal nasal and skin isolants and the ability to hemolyze human erythrocytes and ferment mannitol. In the equine and bovine, however, there did appear to be a tendency for coagulase-positive isolants to be nonhemolytic but mannitol-positive.

This survey has yielded results pertaining to a frequent occurrence of resistance in animal *Staphylococcus* isolants to three commonly used antibiotics (penicillin, dihydrostreptomycin, and terramycin). This pattern of resistance might suggest that a common source existed for the organisms and, moreover, that the organisms were closely related. However, phage typing has not confirmed this. One can only speculate that the clinic environment was responsible for the resistances noted.

Our isolation of four organisms susceptible to phages 80 and 81 indicates that animals may be colonized by the epidemic "hospital type" staphylococci. Pagano and co-workers (7) have reached similar conclusions. Contrary to Smith (10) and Coles and Eisenstark (11) our animal isolants were not susceptible to phage 42D.

The significance of the role of animals in the dissemination of pathogenic staphylococci to their human contacts will depend on the study of epidemiologic data in populations having close and prolonged contact with animals, as compared with unexposed human populations. Furthermore, it must be ascertained whether the high incidence of staphylococci in animals is merely a passive condition brought about by its human environment, or whether the animal may serve as an active transmitting medium of pathogenic staphylococci to humans. A study of this nature is currently in progress at the Colorado State University.

Summary and Conclusions

Results of a study to determine the incidence of coagulase-positive staphylococci in domestic animals indicated a high incidence of coagulase-positive, antibiotic-resistant *Staphylococcus* in these animals, particularly in the canine and the feline. Coagulase production, hemolytic reactions, ability to ferment mannitol, antibiotic resistances, and phage types were determined.

We propose, on the basis of this survey, that domestic animals may possibly serve as a source of pathogenic staphylococci, since the incidence and types of staphylococci isolated from them are indicative of a potential reservoir of pathogenic organisms.

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New Device for Diabetes Detection

C. B. DAVIS, M.D., M.P.H., J. B. EDWARDS, B.S., and A. K. GLOVER

A SALVAGED FLAPJACK skillet and a watermeter cover were the main components of the prototype of a simple, efficient device for performing the Wilkerson-Heftmann (1) blood sugar screening test for diabetes. Developed by laboratory personnel of the Wilmington-New Hanover County Health Department in North Carolina, the Glover-Edwards glucose blood test kit is an outgrowth of a need for a practical device for small-scale diabetes screening.

Since 1952 the health department had performed the Wilkerson-Heftmann screening test with the Hewson clinitron and also by the manual testing of one blood specimen at a time, using methenamine tablets as a source of heat. Other methods tried included the standard quantitative procedures. Conventional methods of quantitative determination, such as the Folin-Wu or Somogyi-Nelson tests, were not practical as screening techniques since these methods were found to be too time consuming.

The Wilkerson-Heftmann blood sugar test, however, offers many advantages as a screening method. Among the advantages is the commercial availability of reagents in tablet form. There is no need for a colorimeter, because the test result can be read positive or negative to a given screening level by observing either the absence or presence of a blue color in the completed test. Also, standard glucose solutions are not necessary.

The expense of automatic testing devices such as the clinitron (about \$1,000) or the auto-analyzer (about \$5,000) and the fact that they

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Figure 1. A. K. Glover performing Wilkerson-Heftmann blood test on prototype of Glover-Edwards glucose blood test kit

are best suited for large-scale screening led to the experimentation with various methods for developing a source of heat combined with a means of supporting the special clinitron tubes necessary for the Wilkerson-Heftmann test. A watermeter cover with appropriate holes drilled into it to accommodate the test tubes was superimposed on a flapjack skillet, and the two units were placed over a tabletop gas burner. From this crude device (fig. 1), which worked satisfactorily as a sandbath-type heating unit for processing the blood specimens, was eventually evolved a compact, electrically heated unit (fig. 2).

The accuracy of tests processed on the new device has compared very well with both the Somogyi-Nelson quantitative method and the Wilkerson-Heftmann test done on the clinitron. A modification of the Wilkerson-Heftmann technique, somewhat similar to the dilution method proposed by Haunz and Weisberg (2), was also worked out using different volumes of blood so that approximate blood sugar levels could be determined over a wide range of values.

The health department conducted diabetes detection activities during the entire period of experimentation with testing equipment. It was not until June 1958, however, that a full-scale detection program was established, using the new device. In the subsequent 2 years 2,941 persons were tested, and 76 cases of diabetes previously unknown were detected. While the development of the screening equipment was the major contribution of the laboratory staff, all members of the health department have contributed to the screening program.

Recognizing the apparent advantages of the Glover-Edwards glucose test kit to a health department's diabetes detection program (its

low cost, about \$40, and its simplicity and efficiency), the North Carolina State Department of Health has purchased 25 of the devices for use by local health departments throughout the State for similar small-scale detection programs. The unit is fabricated of sheet aluminum by a local tinsmith (A), approached by the health department. The glassware and reagent tablets that are necessary for processing the blood specimens are readily obtainable from drug and laboratory supply houses. The device can be plugged into any ordinary 110-volt electrical outlet for operation.

A laboratory staff needs no special training to operate the unit and perform the test. One demonstration usually is sufficient to instruct the technician in the following simple procedures:

1. Plug unit into a 110-115 volt socket. Allow about 15 minutes for calrod unit to heat until red hot.
2. Close heat damper on front completely.
3. Pipette the desired amount of blood into a clinitron test tube containing 5 cc. tapwater or distilled water (B).
4. Lique blood by shaking the tube.

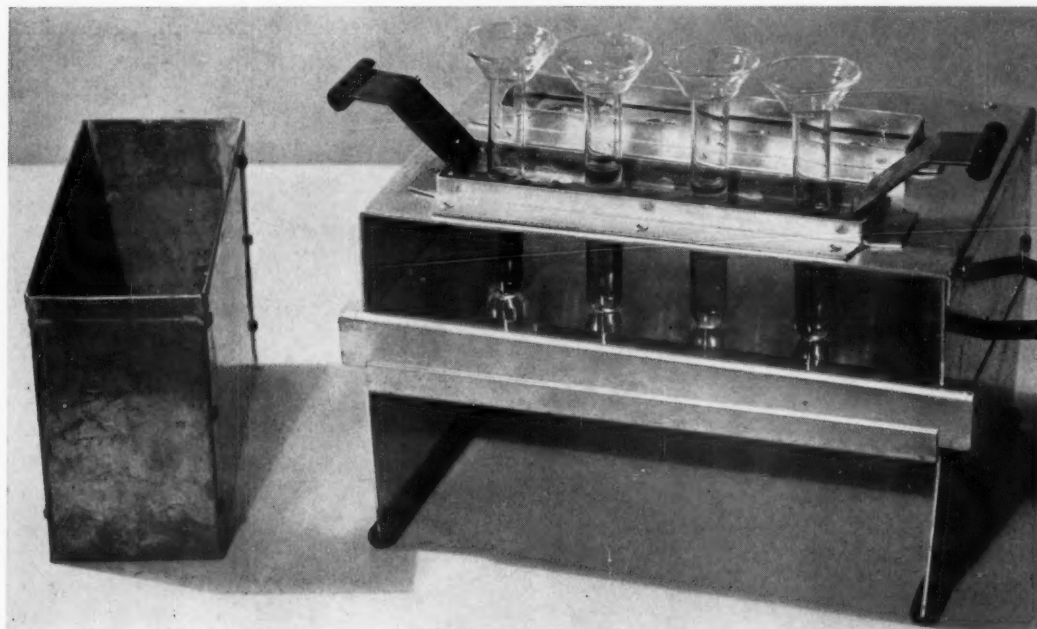


Figure 2. Glover-Edwards glucose blood test kit

5. Add Eli Lilly Co. blood sugar reagent tablets No. 1 and No. 2. Do not shake tube. Four different tablets are necessary to complete each test. Tablets No. 1 and No. 2 precipitate the protein. Either tablet No. 3A or 3B is used to set the screening level (see below). Tablet No. 4 activates the indicator system.

6. Place tube in back section holes that extend to bottom of unit. (End of calrod unit should be to the right of the operator.)

7. Time the first few tests to see if the protein cake is formed and deposited on the lip of the test tube in $1\frac{1}{2}$ to 2 minutes. Adjustment may be made by opening or closing the heat damper in front of the unit.

8. After the protein cake has deposited on rim and "filtrate" is clear, transfer tubes to front set of holes. Allow a few seconds for rapid boiling to cease.

9. Drop in tablet No. 3A or 3B and allow to simmer for exactly $1\frac{1}{2}$ minutes. Add tablet No. 4 while tube is still in front holes and allow about 5 seconds to dissolve.

10. Remove tube from unit, shake, and place in cold water, preferably ice water.

11. Read tubes for color after they have cooled. Any blue in the tube indicates that the blood sugar is below the testing level. A positive test (above the testing level) is colorless.

Following are some commonly used screening levels and the method of screening at each level; the blood sugar levels found are approximations subject to the limitations of the Wilkerson-Heftmann method.

Level (milligrams percent)	Volume of blood (milliliters)	Reagent tablet No.
130-----	0.1	3A
160-----	.1125	3B
180-----	.1	3B

The following are volumes of blood corresponding to different testing levels using No. 3A tablets and 0.2 serologic pipettes. (The pipettes are available from any laboratory supply house.)

Blood (cubic centimeters)	Glucose (milli- grams percent)	Blood (cubic centimeters)	Glucose (milli- grams percent)
0.05-----	260	0.13-----	100
0.06-----	217	0.14-----	93
0.07-----	186	0.15-----	87
0.08-----	162	0.16-----	81
0.09-----	144	0.17-----	76
0.10-----	130	0.18-----	72
0.11-----	118	0.19-----	68
0.12-----	108	0.20-----	65

Four blood specimens can be screened at a time. About 10 minutes is required to complete the tests. Individual blood specimens can be stored up to 4 days by adding sodium fluoride (10 mg./1 ml. of whole blood), which permits the running of tests on a delayed basis if it is more convenient to the laboratory's schedule.

The Glover-Edwards glucose test kit is also readily transportable because of its compactness and lightness. It can be moved from one clinic site to another and set up for testing within a few minutes.

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Mathematical Models of Radionuclides in Milk

E. K. HARRIS, Ph.D., D. S. LICKING, B.S., and J. B. CROUNSE

IN a recent report Campbell and associates (1) summarized specific radionuclide activities determined in monthly milk samples collected in milksheds serving New York City, Cincinnati, St. Louis, Salt Lake City, and Sacramento. In each milkshed all samples collected have come from the same group of farms within a small geographic area. Sampling at these locations began in May 1957 and is continuing, and new sampling stations in the milksheds of Atlanta, Austin, Tex., Chicago, Fargo, and Spokane were added in July and August 1958. At each station, concentrations of strontium 89, strontium 90, cesium 137, barium 140, and iodine 131 have been measured as micromicrocuries per liter.

This report discusses several mathematical models constructed to describe the month-by-month fluctuations observed in specific nuclide concentrations at each sampling site. So far, these models have been applied only to the short-lived nuclides, strontium 89, barium 140, and iodine 131. Only data from the original five milksheds have been included since the other stations do not provide a sufficiently long record of the short-lived nuclides to test these models. Since methods of chemical determina-

tion were not standardized until August 1957, measurements obtained during the ensuing 17 months, through December 1958, were used to estimate parameters; results from January through September 1959 provided a test of the model's predictive ability.

Concentrations of short-lived nuclides observed in milk during these months are plotted in the charts, and the points are joined by solid lines. Data for August 1957 through April 1958 were taken from the report by Campbell and associates (1); those for May 1958 through September 1959 are now in press (2). (Data for August 1957 through February 1959 were also published in congressional hearings (3a).) Since the published measurements of strontium 89 were not corrected for decay between times of collection and counting, they appear lower than the corrected values used in this analysis.

Factors Included in the Model

It is not difficult to list a number of factors which have probably influenced the observed concentrations of short-lived radionuclides in milk. Among these are (a) the pattern and characteristics of the nuclear weapons tests held by the United States, United Kingdom, and U.S.S.R., (b) variable trajectories of radioactive material produced by individual weapons tests, (c) variable detention times of such materials in the upper air, (d) radioactive decay, (e) local monthly precipitation, and (f) feeding practices of cattle in the milksheds where samples have been collected. More subtle influences may be the distribution of radionuclides according to the height of pasture vegetation,

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affecting the month-by-month availability of these elements, and perhaps seasonally variable discrimination by cattle between calcium and radiostrontium.

All of these plus many other influences of an ecologic, meteorologic, or metabolic nature have doubtless played roles in determining the reported concentrations, assuming, of course, that composite samples from collecting stations adequately represent the milk produced in the area and that the chemical methods of analysis have been reliable. However, if we propose to construct a practical model for describing nuclide concentrations in milk, it becomes necessary to include only those factors about which reasonably full knowledge exists or can be obtained for each milkshed.

Of the six factors listed above, only (a), (d), (e), and (f) even partly meet this condition. The following sources provided information on them:

Weapons tests. A recent authoritative list (4) gives date, location, and approximate energy yield of nuclear weapons tests from 1945 through 1958. For this study, tests have been classed into two groups, those occurring inside continental United States and those occurring outside. Wherever possible, tests in each category were assigned a score value in an attempt to classify them according to yield. The scoring scheme, given in the following tabulation, is obviously crude, particularly with respect to outside tests.

Inside continental United States

Yield	Score
<5 kilotons.....	0
5 kilotons- $\frac{1}{2}$ nominal ¹ or well below nominal..	1
About half nominal.....	2
Less than nominal or above half nominal.....	3
Nominal.....	4
Above nominal.....	5
Several times nominal.....	9

Outside continental United States

No yield given.....	1
Moderate, moderate to high, or not in megaton range.....	1
Relatively high, large, megaton range, hydrogen bomb, or substantial size.....	2

¹ Nominal=20 kilotons

A lapse of 2 weeks for inside tests and 1

month for outside tests was assumed to have occurred between the date of a weapons test and the time when its fallout might have affected the nuclide concentration in milk of cows on pasture. A shorter time lapse might have been more accurate for some tests, but calculations with both shorter and longer lapses indicated that 2 weeks and 1 month were the best uniform choices.

We have further assumed that essentially all the fallout of short-lived nuclides occurs immediately following these lapses, moderated in amount by available precipitation. Martell and Drevinsky (5) maintain that short-lived fallout in the United States from Pacific and Soviet tests is of stratospheric origin and may reflect up to several months of upper air storage (see fig. 1 of their paper). Data on strontium 89 during the spring of 1959 in milk samples from St. Louis, Cincinnati, and Sacramento milksheds appear to confirm this hypothesis. In these or similar circumstances, the assumption that all fallout will occur shortly after the test may represent an invalid simplification. However, it will be seen to work fairly well when applied to observed concentrations derived from many series of weapons tests. This point will be discussed later.

Radioactive decay. The half-lives of strontium 89, barium 140, and iodine 131 are known to be (approximately) 54 days, 12.8 days, and 8 days, respectively. With respect to these nuclides, the contribution from any nuclear weapons test was assumed negligible after 12 months.

Local precipitation. Data on daily precipitation (in inches of water equivalent) for each milkshed county were obtained from local climatologic summaries issued monthly for each State by the U.S. Weather Bureau. The index used was average monthly precipitation per county over the entire milkshed area.

Feeding practices. The estimated proportion of cows on pasture in each milkshed, by month, was the only index used. The estimates, given in table 1, were based on individual farm surveys conducted by local health officers or dairy plant officials (1). Animals in the barn were assumed to be feeding on locally harvested grain plus supplement, an assumption largely verified by information supplied during the farm surveys. A uniform harvest date of Au-

gust 15 was applied as needed in developing the models. Any such date would be of no consequence in southern States where cows are on pasture all year round.

Construction of a Model

A model incorporating these factors may perhaps best be developed through an example. Suppose that we wish to account for the observed concentration of strontium 89 in milk from the St. Louis area during October 1958. Recall two assumptions: one, that 2 weeks and 1 month elapse before radioactive material from tests inside and outside the United States affect the milk and, two, that local feed is harvested about August 15. It follows that all cows in the milkshed have been exposed to accumulating and decaying fallout from month-after-month testing programs prior to July 15 (outside tests) or August 1 (inside tests), 1958.

During October in the milkshed serving St. Louis, an estimated 45 percent of the cows are on pasture. The remaining 55 percent are assumed shielded from any immediate effects of tests between August 1 and October 1 (date of milk sample collection was October 15), although each cow in this 55 percent group was probably on pasture for some time during this 2-month period. We are assuming, therefore, that each month's concentration of radionuclides in the milk reflects only those ingested shortly before collection of the sample. This assumption accords with statements by C. L. Comar (3b), who reported results of an experiment on dairy cows indicating that 96.5 percent of strontium 90 eaten by a cow is eliminated within a day in the feces or urine and about 1

percent in the milk, while almost all the remainder is deposited in the bone.

Let w_{1j} denote the yield score assigned to the latest inside test prior to October 1, 1958, where the subscript j refers to the test date. Multiply w_{1j} by its decay factor $e^{-\lambda t_{jk}}$ where t_{jk} denotes the elapsed time between the test date and the date of sample collection and λ is a radioactive decay constant equal to 0.691 divided by the half-life in months (thus, $\lambda=0.39$ for strontium 89). Summing such products for tests back to August 1 and multiplying this sum by 0.45 computes that part of the contribution from inside tests to strontium 89 in milk through the pastured group of cows in the St. Louis area during October 1958. The remaining contribution is calculated by summing similar products (multiplied by unity rather than 0.45) for tests between October 1957 and August 1, 1958. An identical operation with respect to outside tests scored as w_{2j} , starting with the latest test prior to September 15, 1958, completes the total contribution of strontium 89 activity.

So far the model has taken no account of monthly fluctuations in precipitation. This factor may be included in either of two ways: One, multiply each yield score, w_{1j} or w_{2j} , by the monthly local precipitation covering the fallout date for that test, for example, August precipitation for an outside test on July 15 or July precipitation for an inside test on July 10; or, two, multiply each summed product, say

$$\sum_j w_{ij} e^{-\lambda t_{ik}},$$

by the index during the k th month, that is, the month of sample collection. The first of these procedures has been adopted. It is the more log-

Table 1. Estimated proportion of cows on pasture, by month and State

State	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Wisconsin	0.00	0.00	0.00	0.32	0.92	0.95	0.95	0.95	0.95	0.50	0.00	0.00
Texas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
North Dakota and Minnesota	.00	.00	.00	.04	.84	.94	.96	.96	.86	.69	.00	.00
California	.08	.10	.47	.81	.84	.84	.84	.84	.83	.72	.32	.12
Ohio	.20	.20	.22	.36	1.00	1.00	1.00	1.00	1.00	.98	.78	.37
Missouri	.01	.02	.13	.94	.97	.97	.97	.95	.93	.45	.09	.03
Georgia	.98	.98	.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.98	.98
New York	.00	.00	.00	.00	.62	1.00	1.00	1.00	1.00	.87	.01	.01
Utah	.00	.00	.00	.00	.61	.71	.75	.75	.78	.45	.02	.00

ical in view of our assumption that essentially all the short-lived fallout from each test occurs immediately following a defined lapse period.

Finally, to convert the weighted yield scores to micromicrocuries of activity per liter of milk, we multiply the separate contributions from inside and outside tests by scale factors a_1 and a_2 , respectively. At this point, then, the model for a specific nuclide may be expressed as follows:

$$Y_{ik} = a_{1i} \left(\sum_{j=k-12}^{\text{Aug. 1}} r_{ij} w_{1j} e^{-\lambda_{ik}} + p_{ik} \sum_{j>\text{Aug. 1}}^{k-1} r_{ij} w_{1j} e^{-\lambda_{ik}} \right) + a_{2i} \left(\sum_{j=k-12}^{\text{July 15}} r_{ij} w_{2j} e^{-\lambda_{ik}} + p_{ik} \sum_{j>\text{July 15}}^{k-1} r_{ij} w_{2j} e^{-\lambda_{ik}} \right) \quad [1]$$

where

Y_{ik} denotes the concentration of the given radionuclide during the k th month in the i th milkshed,

p_{ik} represents the estimated proportion of cows on pasture during the k th month in the i th milkshed, and

r_{ij} denotes average precipitation in inches of water over the i th milkshed during the month of fallout from the j th test.

The other symbols have already been defined.

The coefficients a_{1i} and a_{2i} are estimated by ordinary least squares, the quantities in parentheses serving as the two independent variables. Equation 1 is written for an individual milkshed, allowing separate coefficients to be estimated for each shed.

This model requires that each weapons test be handled individually although many small tests were assigned a score of zero. Therefore, many calculations of elapsed times, decay functions, and subsequent products and sums were necessary for each of the 15 nuclide-milkshed combinations. To expedite computation, the model was programed and run on an electronic computer.

Simpler Models

If local precipitation, though not constant, were always sufficient to return to earth an

amount of short-lived radioactive material roughly proportional to the yield of the test from which it originated, the coefficients a_{1i} and a_{2i} would include this proportional factor, and there would be no need to introduce precipitation explicitly. This slightly simpler version of model 1 will be called 1a.

Comparison of the charts with table 1 shows that the seasonal pattern of observed concentrations tends to follow similar changes in the proportion of cows on pasture. This finding has been further supported by data from Atlanta and Austin (2), where cows were almost always on pasture. In these cities, short-lived nuclide concentrations did not decline during the winter months. The general correspondence between short-lived nuclides in milk and the proportion of cows on pasture indicates that by far the greatest amount of activity is derived from feed or air rather than surface waters. This agrees with findings by Comar and associates (6).

Relying on the feeding practices index to explain the general seasonal pattern, one may call upon local precipitation during the month of sample collection to account for monthly deviations from the seasonal level. We might then be able to describe observed fluctuations in nuclide concentrations with a much simpler model, ignoring entirely the schedule of weapons tests.

These two factors, the proportion of cows on pasture and monthly precipitation, may be combined in a variety of forms. Two basic models are:

$$Y_{ik} = a p_{ik} p_{ik} \quad [2]$$

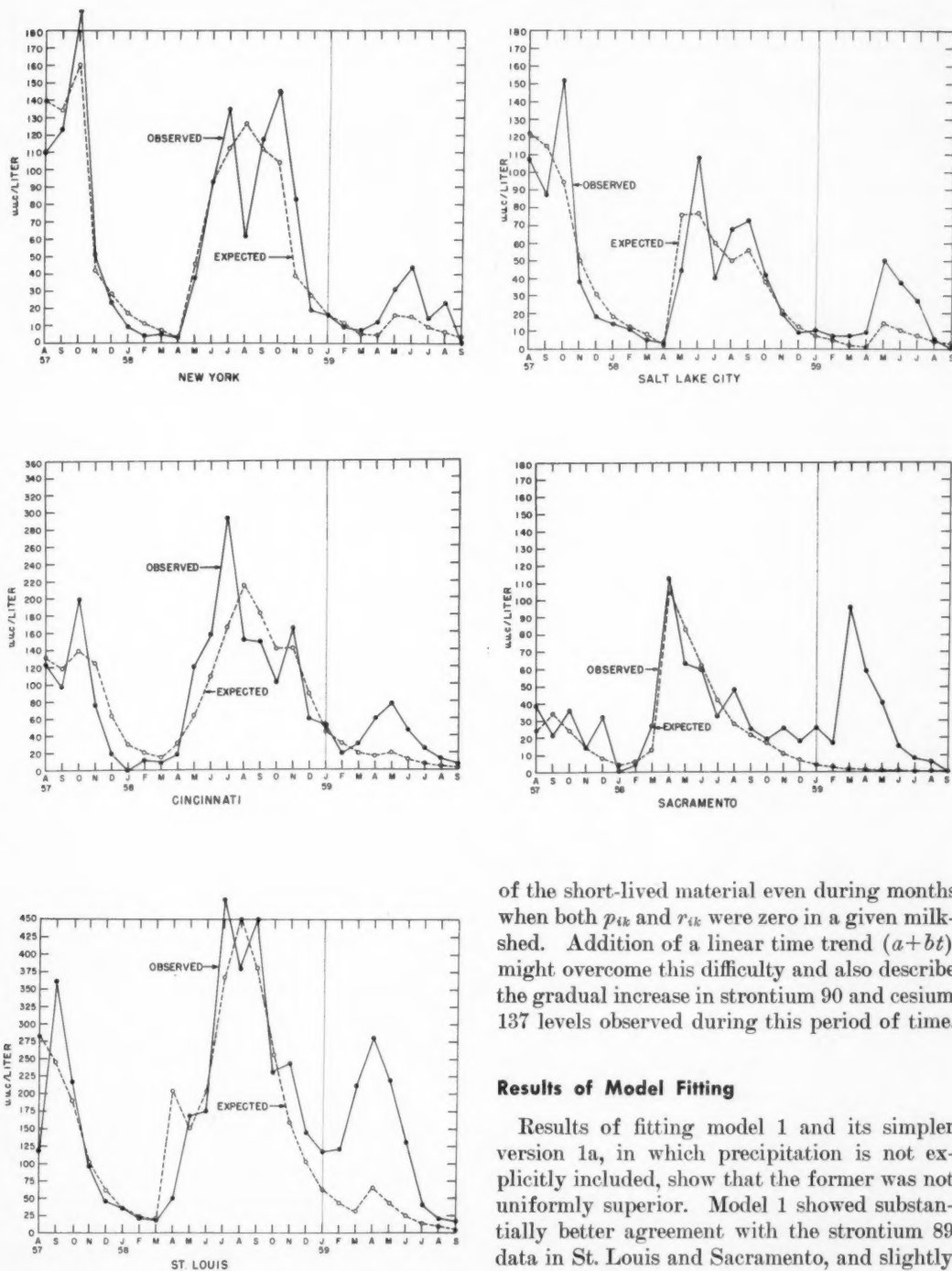
and

$$Y_{ik} = a_1 p_{ik} + a_2 p_{ik} \quad [3]$$

where the a 's, as before, are scale coefficients to be estimated by least squares.

Model 2 asserts that the concentration of any nuclide in milk collected during a given month will be zero if precipitation is zero during that month or if all cows are kept in the barn. Model 3 allows these factors to operate independently. Another formula, obtained by adding equations 2 and 3, will be referred to as model 4. These models would not apply to strontium 90 and cesium 137, which have not shown the marked fluctuations characteristic

Figure 1. STRONTIUM 89: Observed and expected concentrations in samples of milk from specified milksheds, August 1957–September 1959

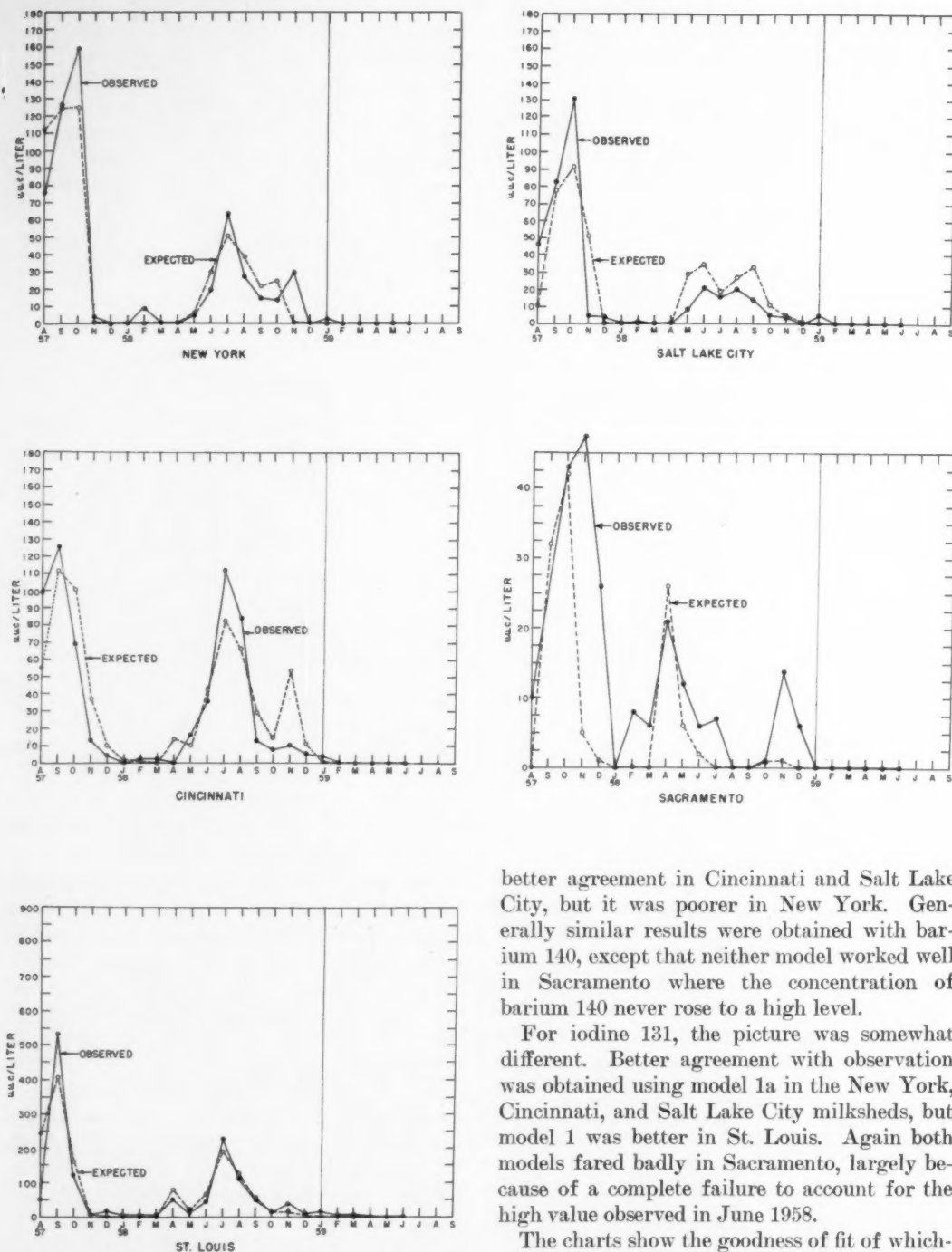


of the short-lived material even during months when both p_{ik} and r_{ik} were zero in a given milkshed. Addition of a linear time trend ($a+bt$) might overcome this difficulty and also describe the gradual increase in strontium 90 and cesium 137 levels observed during this period of time.

Results of Model Fitting

Results of fitting model 1 and its simpler version 1a, in which precipitation is not explicitly included, show that the former was not uniformly superior. Model 1 showed substantially better agreement with the strontium 89 data in St. Louis and Sacramento, and slightly

Figure 2. BARIUM 140: Observed and expected concentrations in samples of milk from specified milksheds, August 1957–September 1959

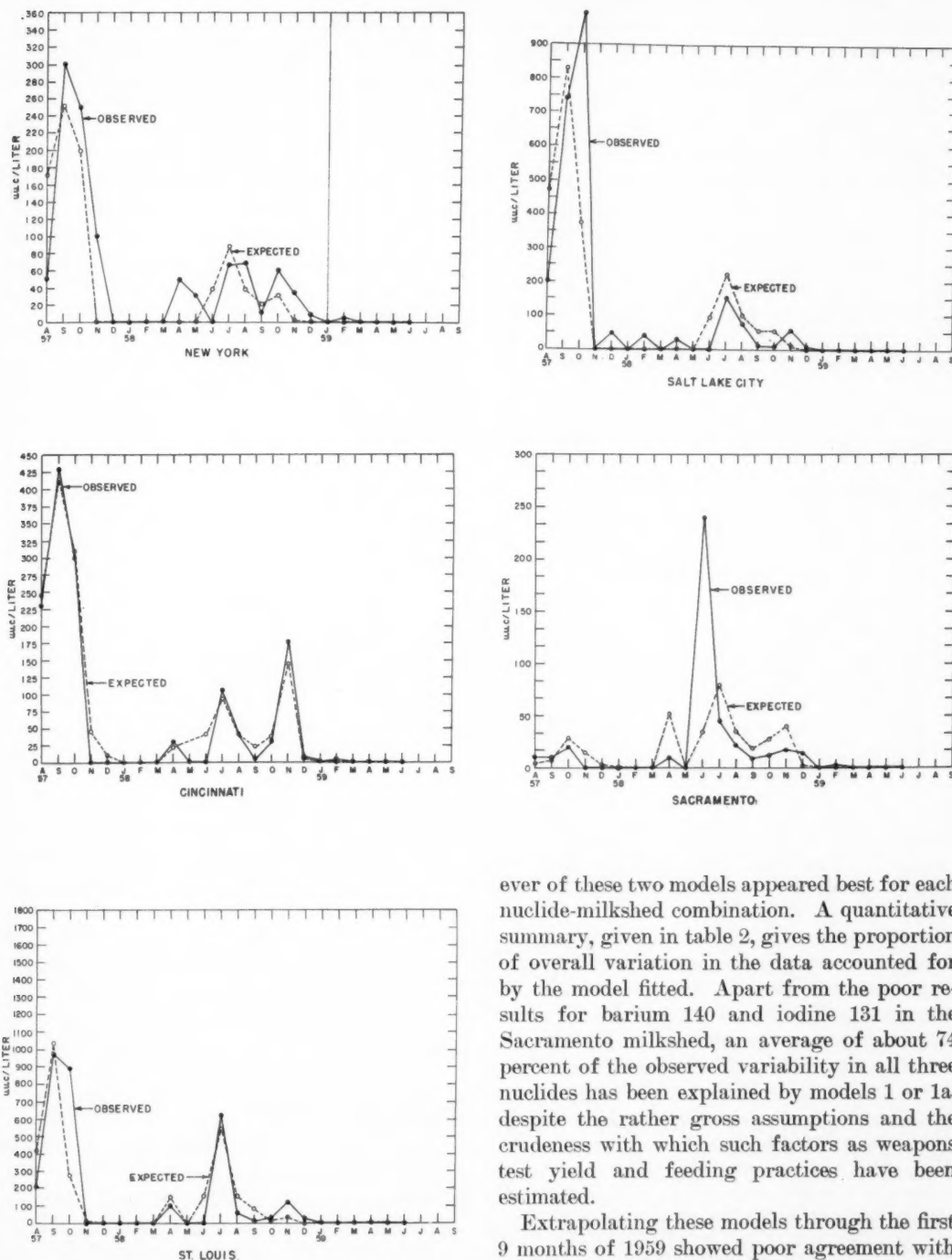


better agreement in Cincinnati and Salt Lake City, but it was poorer in New York. Generally similar results were obtained with barium 140, except that neither model worked well in Sacramento where the concentration of barium 140 never rose to a high level.

For iodine 131, the picture was somewhat different. Better agreement with observation was obtained using model 1a in the New York, Cincinnati, and Salt Lake City milksheds, but model 1 was better in St. Louis. Again both models fared badly in Sacramento, largely because of a complete failure to account for the high value observed in June 1958.

The charts show the goodness of fit of which-

Figure 3. IODINE 131: Observed and expected concentrations in samples of milk from specified milksheds, August 1957–September 1959



ever of these two models appeared best for each nuclide-milkshed combination. A quantitative summary, given in table 2, gives the proportion of overall variation in the data accounted for by the model fitted. Apart from the poor results for barium 140 and iodine 131 in the Sacramento milkshed, an average of about 74 percent of the observed variability in all three nuclides has been explained by models 1 or 1a, despite the rather gross assumptions and the crudeness with which such factors as weapons test yield and feeding practices have been estimated.

Extrapolating these models through the first 9 months of 1959 showed poor agreement with

strontium 89 data, as shown in figure 1. The trend is roughly parallel (except in Sacramento), but the predicted level is much too low. This may be due partly to an underestimate of the relative yield of the Soviet test series during October 1958. Martell and Drevinsky (5) estimated the yield of this series to be three to five times higher than that of any earlier Pacific test series conducted by the United States or the United Kingdom back to August 1956. The scoring applied in this paper has probably undervalued this Soviet contribution by a factor of 2. A truer weighting would have produced a fairly satisfactory extrapolated fit to the strontium 89 observations in New York and Salt Lake City, but expected values in Cincinnati, St. Louis, and Sacramento would still be too low. One possible explanation for the discrepancy in St. Louis is that a higher proportion of cows were on pasture during November and December 1958 than indicated in table 1.

Under the theory of Martell and Drevinsky, this substantial rise observed in strontium 89 during the spring of 1959 represents delayed fallout of surviving stratospheric activity produced by the Soviet test series of October 1958 and precipitated by spring rains. Its shifting appearance in milk, reaching a peak earlier in Cincinnati, St. Louis, and Sacramento than in New York and Salt Lake City, reflects differences among the milksheds in the proportion of cows on pasture during the early months of the year (see table 1). During the years 1956-58, characterized by many series of tests, delayed stratospheric fallout of strontium 89 from one series may have simply added to a more im-

mediate tropospheric fallout fraction contributed by a later series. This would explain why model 1 or 1a described fairly well the strontium 89 data during this period but often fell short of very high concentrations. Data on barium 140 and iodine 131 during early 1959 indicate that these nuclides have either fallen out or decayed within the time allowed in the model.

The magnitudes of coefficients a_1 and a_2 in models 1 or 1a have no meaning in themselves since the variables X_1 and X_2 are dimensionless. However, ratios $a_2:a_1$ for each nuclide may be compared from city to city. This comparison would indicate the relative importance of tests outside and those inside continental United States as contributors to the nuclide content of milk from different sheds. These ratios are listed in table 3. Only one general conclusion may be gleaned from this table, that is, the not unexpected finding that tests outside the United States have provided a relatively greater contribution to strontium 89 than to either barium 140 or iodine 131 activity in these milksheds, with the possible exception of Sacramento.

Turning to the simpler models, 2, 3, and 4, involving only monthly precipitation and the proportion of cows on pasture, table 4 shows the percentage variation explained by these formulas. With respect to strontium 89 data, all these models show substantially poorer agreement than does either model 1 or 1a except in Cincinnati. Here model 4 more faithfully reproduced the steep rise in strontium 89 from the Hardtack series during May-July 1958.

None of these simpler models succeeded in adequately describing barium 140 or iodine 131 concentrations. This was clearly due to the inability of broad, seasonal trends in feeding practices or random fluctuations in precipitation to cope with spikes of very short-lived radioactivity produced by specific groups of weapons tests.

Application to Strontium 90 and Cesium 137

For several reasons model 1 (or 1a) is not well suited to describing the monthly series of long-lived nuclide concentrations observed in milk. First, no allowance is made for long-delayed stratospheric fallout of these nuclides from

Table 2. Percentage variation accounted for by models 1 or 1a

Nuclide	Milkshed				
	New York	Cincinnati	St. Louis	Salt Lake City	Sacramento
Strontium 89 ¹ ----	79	59	71	73	75
Barium 140 ¹ -----	88	74	78	68	4
Iodine 131 ² -----	66	97	69	60	4

¹ New York, model 1a; other cities, model 1.

² St. Louis, model 1; other cities, 1a.

Table 3. Ratios of "outside" to "inside" test coefficients ($a_2 : a_1$) in model 1 or 1a

Nuclide	Milkshed				
	New York	Cincinnati	St. Louis	Salt Lake City	Sacramento
Strontium 89-----	3.1	4.4	5.3	10.6	2.2
Barium 140-----	1.7	1.9	.8	6.2	-----
Iodine 131-----	2.1	1.6	3.1	2.0	-----

Table 4. Percentage variation accounted for by models 2, 3, and 4

Nuclide and model	Milkshed				
	New York	Cincinnati	St. Louis	Salt Lake City	Sacramento
Strontium 89:					
2-----	44	50	19	17	<10
3-----	58	62	42	56	34
4-----	55	74	38	62	58
Barium 140:					
2-----	<10	28	12	22	<10
3-----	30	31	16	18	<10
4-----	45	37	10	23	<10
Iodine 131:					
2-----	<10	<10	<10	<10	<10
3-----	<10	21	<10	<10	<10
4-----	28	15	<10	<10	<10

Pacific and Soviet tests. Second, it would be difficult to determine the relative contribution of earlier nuclear tests to long-lived nuclides currently available to cattle on pasture. Finally, in the absence of appreciable radioactive decay, model 1 must necessarily predict a monotonic increase in nuclide concentration. From August 1957 through May 1959, the trend of long-lived nuclide concentrations in milk has generally been upward (1,2), but downward fluctuations have occurred during many individual months. The model could not hope to reproduce these.

These objections are largely overcome or avoided in the simpler models. For example, the use of precipitation during the month of sample collection rather than the month of assumed fallout indirectly recognizes the importance of delayed fallout. Moreover, since these models fitted much better to strontium 89 data than to barium 140 or iodine 131, they might

be expected to explain the observed variations in strontium 90 and cesium 137. Model 4, with the addition of a simple time trend, looks particularly promising. A later report will discuss the results of fitting this model to published concentrations of strontium 90 and cesium 137 in milk from a number of different milksheds.

Summary

Mathematical models have been developed and fitted to monthly observations of strontium 89, barium 140, and iodine 131 in milk samples from five milksheds serving large urban populations. The most complicated of these models (model 1) included the following factors: previous nuclear weapons tests, radioactive decay, monthly precipitation, and the proportion of cows on pasture each month. This model fitted reasonably well all series of data except those for barium 140 and iodine 131 in the Sacramento samples. It failed, however, to predict the high levels of strontium 89 observed during the spring of 1959 in the Cincinnati, St. Louis, and Sacramento milksheds. This was probably due partly to an undervaluation of the yield of Soviet nuclear tests in late 1958 and partly to delayed stratospheric fallout of strontium 89, an event which would be obscured during years of repeated series of tests.

Simpler models included only the last two of the four factors expressed separately or as a product. These models were far too rigid to describe the sudden peaks and dips in barium 140 and iodine 131 data. They did better with strontium 89 but not as well as model 1.

With respect to the long-lived nuclides, strontium 90 and cesium 137, certain objections may be raised to model 1 which are avoided or overcome in the simpler models. Further work with one of these models, modified by the addition of a simple time trend, should test its applicability to the series of long-lived nuclide concentration.

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Legal Note . . .

Zoning—Regulation of Nonconforming Uses

An ordinance regulating sand pit operations in a residential district which had the practical effect of precluding its continued operation as a "nonconforming" use held valid as exercise of police power where hazard to welfare existed. *Town of Hempstead v. Goldblatt et al.*, 9 N.Y. 2d 101, 211 N.Y.S. 2d 185 (1961).

The defendant appealed from a judgment of a lower court upholding the constitutionality of a town ordinance and enjoining the defendant from conducting a sand mining operation in the town until certain violations of the ordinance had been corrected and a permit obtained. The ordinance was attacked as confiscatory and in violation of the due process clause of the Federal and State constitutions.

In 1927 the defendant purchased 38 acres of land in a rural area and began to mine sand and gravel. When excavation went below water level, the defendant began dredging. In 1930, after dredging began, provisions for residential zoning were enacted by the town of Hempstead and thereafter the surrounding area became heavily populated. Within a radius of 3,500 feet of the pit were more than 2,200 homes, and 4 schools with an enrollment of 4,500. At the time of the suit, the dredging had created an artificial 20-acre lake with an average depth of 25 feet. The remainder of the plot was entirely occupied by defendant's machinery.

Pursuant to the requirements of a 1945 ordinance, the defendant enclosed the entire property with 7,000 lineal feet of a 6-foot chain-link fence topped by three strands of barbed wire. Other requirements of the ordinance governing the slope of the pit sides and the distance of the excavation from the property line were also complied with, so that although the business was a "nonconforming" use under the zoning ordinance, it operated in conformity with the 1945 ordinance until 1958 when the ordinance was amended.

The amended ordinance, in order to protect against the danger "of cave-ins, falls, drownings, and water pollution," made new provisions for setbacks, degrees of slope, barricade, fences, lights, retaining walls, and maximum ground water level for all open excavations. The defendant, who conducted the only sand and gravel mine in the town,

would be required to lay a concrete curb beneath the existing fence, a requirement that could only be met by removing the fence, laying the concrete, and constructing a new fence.

It also prohibited excavation below water level or more than 10 feet below the highway level. Finally, it required the fill-in of all excavations not complying with these new requirements. To obtain a permit to continue business, the defendant would have to fill in approximately 1 million cubic yards of excavation, at a cost of more than \$1 million.

The defendant argued that the ordinance was invalid since it was in essence a retroactive zoning ordinance calculated to destroy a substantial investment in the mining operation, which was a pre-existing nonconforming use.

This argument was rejected by a four-to-three decision of the New York Court of Appeals. Noting that the 1958 amendments did not prohibit the continuance of sand mining as a nonconforming use under the zoning ordinance, the court, taking into account the location of the pit in a heavily populated area, held it to be an appropriate regulation of a dangerous situation, declaring: "The hazards to both life and property accompanying the uncontrolled operation of these pits are common knowledge, and their restraint need not await an event."

An ordinance, such as here involved, which is an exercise of statutorily delegated police power, is not to be held invalid as a matter of law, said the court, "unless there is no justification on 'any state of facts'." On the record, there was a reasonable apprehension of a threat to the community's welfare. The "reasonableness, wisdom and propriety" of the ordinance, under these circumstances, was for the legislators, not the courts, to determine.

In discussing the scope of the police power, the court quoted with approval the statement that this power is "one of the most essential powers of govern-

ment, one that is the least limitable. . . . A vested interest cannot be asserted against it because of conditions once obtaining. To so hold would preclude development and fix a city forever in its primitive conditions."

Finding a rational basis for the ordinance, the court sustained its constitutionality and upheld the judgment appealed from.

Comment: This four-to-three decision emphasizes the broad sweep of the police power before which even substantial private interests must yield. As pointed out in the dissenting opinion, the "regulatory" ordinance imposed conditions on the de-

fendant's use of his property for sand mining which effectively precluded the continuance of this non-conforming use, a result which could not have lawfully been achieved by a zoning ordinance.

Note: Defendant's application for review of the judgment was approved by the U.S. Supreme Court which noted probable jurisdiction on June 5, 1961 (29 L.W. 3366). The case will probably be heard in the fall term of the Court.—SIDNEY EDELMAN, assistant chief, Public Health Division, Office of General Counsel, Department of Health, Education, and Welfare.

Early Infectious Syphilis Increases

The 4,508 cases of early infectious syphilis reported for the quarter year July–September 1960 represent a 72.2 percent increase for the same quarter of the previous year. This is the sharpest rise in infectious syphilis ever reported in the United States within so short a time.

Health officials of 24 States and 48 major cities consider the rise in syphilis morbidity to be essentially an increase in the rate of occurrence. Although improved casefinding and better reporting are factors, health officials think that these alone would not have produced the sharp increases noticeable in widely separated cities this year.

A substantial number of States and cities are conducting studies of morbidity reporting among private physicians. Fifteen States and 24 cities report such studies. Private physician reporting of early infectious syphilis improved somewhat over the past year. The number of States reporting increase in private physician reporting was 28 compared to 25 last year, and the number of cities was 46 compared to 27.

Between 1957 and 1959 there has been a steady increase in the number of venereal disease cases reported among persons 19 years of age and under: 48,964 in 1957, 53,881 in 1958, and 55,763 in 1959. There was a sharp increase in the number of cities reporting rise in infectious syphilis in ages 15 to 19 and 20 to 24. A year ago, 21 cities reported in-

creases in early infectious syphilis among the 15- to 19-year group; this year, 31. A year ago 25 cities reported increase in early infectious syphilis in the 20- to 24-year group; this year, 38.

Thirty-nine States reported areas without adequate venereal disease control coverage. Among the areas named by States are 32 cities, 276 counties, and 5 other areas. The total population in the inadequately covered areas is 30,796,282. Lack of personnel is the major problem in the matter of inadequate coverage.

Schools in more than half the States and cities are teaching something in some course about venereal disease. In 26 States and 51 cities, public schools provide instruction that includes venereal diseases. In 24 States and 36 cities the public schools do not provide such instruction. In 19 States and 21 cities, parochial schools provide instruction that includes venereal diseases; in 26 States and 50 cities they do not.

Although 45 States and 87 cities make VD educational resources available to schools and other educational establishments, half of the States and over one-third of the cities were unable or did not attempt to provide information on course content.—*Excerpts from a joint statement by the Association of State and Territorial Health Officers, the American Venereal Disease Association, and the American Social Health Association, March 1961.*

Baltimore's Slum Housing Clinic

ROBERT F. SWEENEY, LL.B.

THE BLIGHT of slums that faces Baltimore is not unique; the same civic cancer troubles most of the large cities in the United States today. Some original techniques have been devised by Baltimoreans to combat slums, however, and several have been copied by similarly affected cities. Among these is the so-called Baltimore plan, an effort to bring about block-by-block rehabilitation, structurally and aesthetically, through the cooperation of property owners, occupants, police department, and the Baltimore Bureau of Urban Renewal and Housing Authority. Baltimore also pioneered in code enforcement with the creation in 1947 of the housing court of Baltimore City.

The housing court is a special magistrate's court, originally created by executive order of the Governor of Maryland, with the cooperation of the city departments charged with the enforcement of building, zoning, and sanitary codes. At its most recent session, the Maryland Legislature gave the court statutory recognition and permanent status by making it part of the new municipal court system for Baltimore City. The importance of the court was emphasized by the legislature's action in providing that the judge of the housing court remain in that post for at least 1 year; judges in all other municipal courts may be rotated at any time by order of the chief judge.

On May 1, 1959, I was appointed by Governor J. Millard Tawes as magistrate of the housing court. During my first year in this post, I acquired, deservedly or not, the reputation of be-

ing "very tough" because of a policy of levying heavy fines on slum landlords and property owners. The maximum fine the court can impose for any single violation is \$100, but each day a violation is continued can be listed as a separate violation, and, therefore, the possible fine can be much larger. (Under city laws, landlords are responsible for structural defects.) However, some landlords still treat fines as a cost of doing business.

Tenants who appear in housing court are charged with such offenses as lack of proper refuse containers and unclean or insect- or rodent-infested premises. When a health official or a police sanitarian discovers a violation, a notice of correction is issued, requiring compliance within a given period, normally 7 to 30 days. If reinspection reveals that the condition remains uncorrected, the tenant is summoned to housing court.

But fines for landlords and tenants were not sufficient to stem the spread of blight. Some radical step seemed to be needed to bring about better compliance with the law on the part of occupants of substandard homes. Many persons violated the laws regarding sanitation, health, and fire hazards not through intent, but because they had never been properly advised as to how to live in an urban setting. Many were newcomers from rural areas who were able to function quite properly in that setting, but who had failed to adjust to metropolitan living. Also, many long-time residents, because of socioeconomic problems, had never had the opportunity to learn how to achieve cleanliness and order in a substandard environment.

I felt that it would be far better for the community if these people were instructed in good living habits rather than punished with heavy

Mr. Sweeney became an assistant attorney general for the State of Maryland on May 1, 1961. For 2 years previously he was magistrate of the housing court of Baltimore City.

finances which might wreak economic havoc on a family and leave the offender with no knowledge of how to prevent future violations. I discussed the plight of these persons with William Sallow, Edgar Ewing, and Albert Rosenberg, department heads of the Baltimore Urban Renewal and Housing Authority and with Wilmer Bell, director of adult education for Baltimore. These officials were equally aware of this weakness in the enforcement procedure.

As a result of these discussions, the idea for the housing clinic, as a means of instructing offenders, was born. Created in March 1960, the clinic was to operate under private auspices supervised by the author in his capacity as magistrate of the housing court. It would consist of a series of lectures, discussions, and demonstrations.

At the outset, we checked with the attorney general's office to confirm that under the existing probation powers, the housing court magistrate had sufficient authority to allow a defendant to attend a course of this nature, if the defendant agreed to do so. Authority to compel anyone to attend this clinic would not be necessary, I felt, because voluntary attendance would be a prerequisite to obtaining the complete cooperation of the student.

Tentative plans were drawn up for an 8-week course covering in detail matters fundamental to urban living. An advisory board was created consisting of members of the health department, bureau of urban renewal and housing, police department, city council, Senate and House of Delegates of the State of Maryland, and the Baltimore Bureau of Building Inspections.

A suggested curriculum was drawn up by Mr. Bell, and he recommended two eminently qualified young men who were interested in serving as moderators and instructors in the clinic. Both had experience in group counseling with the unschooled, which was especially desirable, for it was obvious that many potential candidates for the clinic were persons with little or no formal education.

The instructors, Herbert J. Stern and Richard W. Bateman, were enthusiastic about the housing clinic and agreed to accept the positions of "coordinators" for nominal salaries.

They undertook to expand the suggested curriculum and to prepare the series of eight separate programs to be given on successive weeks.

While they were thus engaged, I checked with all interested persons and agencies to make certain that the procedure which we were contemplating was legal and unobjectionable. Governor Tawes approved "enthusiastically and wholeheartedly," and J. Harold Grady, mayor of Baltimore, offered whatever assistance we might require from the city agencies.

The advisory board was convened and its members contributed many worthwhile suggestions. Officer John McAlister, sanitation bureau, Baltimore Police Department, and clerk of the housing court for 13 years, also made many practical suggestions concerning the curriculum. An unused school room, centrally located in downtown Baltimore and ideal for our purpose, was offered as a meeting place.

On April 15 a release was issued to the press and to radio and television stations in the area announcing the plans for the clinic. The release stated that we hoped to raise \$1,000 by private donations to conduct the project for a 1-year period. All of Baltimore's newspapers supported the clinic editorially, and we were able to raise the needed money in 10 days.

Beginning April 1, 1960, I began to offer the opportunity of attending the clinic to certain convicted defendants in housing court. Twenty-three defendants, approximately 25 percent of the tenants appearing before me in the court, were given the opportunity to attend the first clinic session, and all accepted.

My personal judgment was the basis for choosing the candidates. The selection was governed by such factors as the desire of the defendant to improve his living conditions, family size, educational level, financial status, and the neighborhood.

The first session on the evening of May 10, 1960, was devoted primarily to a discussion of the laws city dwellers are compelled to observe. We also explained the methods we planned to employ in the housing clinic and expressed our purpose as the hope of creating a more wholesome atmosphere for the students and their children.

At the start, the students were uneasy, appre-

hensive, and somewhat embarrassed at being in a group of this nature. Therefore, in welcoming them, I stressed the educational aspects of the clinic and emphasized that they had indicated their desire to become better citizens by volunteering to attend. When the coordinators took over the class at the conclusion of my opening remarks, they reiterated, and continued to emphasize throughout the 8-week course, the educational rather than the punitive nature of the clinic.

Encouraging each student to talk about the charge which brought him to the housing court and asking him to discuss the particular problems of his neighborhood also helped to break the ice. The other students were heartened to find their difficulties were not unique.

However, the most effective step in easing the tension was stressing to these people, most of whom lived in rented homes, the legal obligations of landlords to make repairs and to keep buildings structurally safe. We also advised them of various ways to compel landlords to comply with the laws when they would not act voluntarily. We mentioned the tenant's right to legal notice before eviction and then stated what the law required of the tenant and his obligations to the landlord, his own family, and the community.

We were immensely heartened to observe as the weeks went by the increased interest and participation of our students. Their dress and grooming improved week by week, they were increasingly prompt, and unexcused absence was reduced to a bare minimum. An indication of interest was the students' request at the second session that they be permitted to bring husbands or wives to class. In the year that the course has been given, about 20 class members have brought a spouse to one or two lectures, and another 20 brought a friend or neighbor to one or more classes. One woman brought her husband to all eight sessions.

The curriculum included matters fundamental to living, particularly in a substandard urban community. An expert in a particular field lectured in understandable terms on his specialty for the first hour. The second hour was devoted to a discussion led by the coordinators on how the particular subject matter of

that evening's session applied to the members of the class.

The experts were, for the most part, career city employees who gave freely of their time to assist in every phase of the project. The lecturers included an instructor in manual arts in the city schools, a captain of the fire department, a member of the Visiting Nurse Association, the clerk of the housing court, a dietitian, the director of adult education, and department heads of the bureau of urban renewal and housing authority.

The course of study appears on p. 696. This outline was followed with only minor modifications for subsequent courses. The tenants felt they knew how to make the simple household repairs demonstrated at the second session, so we eliminated this activity and devoted additional time to discussing methods for controlling insects and rodents. Also, specific problems the students raised were discussed.

Students were encouraged to put into immediate use suggestions they heard in the clinic. Each week they were urged to advise classmates of any changes or improvements in their own homes or living habits. The staff of the housing clinic was particularly encouraged by these discussions, for they were proof that the course was of practical value. When we planned the 1½-hour field trip to observe some of Baltimore's substandard areas, three students asked us to include their homes on this tour, so that they might show their classmates the improvements they had made since the clinic started.

We were impressed and touched on the evening of the last class when five or six students thanked us for our efforts in their behalf. They assured us of the good effects of the clinic and urged us to continue and expand it.

Perhaps the most gratifying reward was the discovery, by means of discreet reinspection of approximately 15 homes, that a more wholesome atmosphere prevailed. Improvement in cleanliness was the most obvious change, but there were also new curtains and newly painted walls and furniture. The most startling specific transformation was in the yard of one woman. It was knee-deep in garbage at the time she was brought into court. When she

finished the housing clinic course her yard was as clean as it could be, and she had planted flowers in several pots.

We have also found that many graduates, emboldened by their newly acquired knowledge of a landlord's responsibilities, have compelled their landlords to make structural repairs.

It must be emphasized that the clinic has been an experiment, and we do not claim the discovery of a cure for slums. The 8-week course has been given only four times, and approximately 110 persons have attended. It is too early to evaluate it completely. The real test of the success of the housing clinic will

Housing Clinic Curriculum

Orientation

1. Explanation of law: rights and obligations of tenants and landlord.
2. Setting of tone: violators are not criminals, but are selected for potential to learn and apply ideas.
3. Explanation of content and purpose.
4. Building of relationship with and within group.

Care of House and Yard

1. Demonstration and practical exercise in simple household repairs and maintenance and rodent and insect control.
2. Building of motivation and clarification of values in caring for a home; civic responsibility.
3. Extension of group to include husbands or wives in recognition of full and mutual responsibilities of a family.

Safety at Home

1. Demonstration of fire alarm systems; discussion of fire prevention.
2. Simple first aid measures and accident prevention.
3. Practical applications in individual home setting.

Family Health

1. Group discussion under direction of resource person on physical, mental, and environmental health of the family.
 - (a) Practical problems, such as personal hygiene and infant care, and ways of coping with them.
 - (b) Use of independent and community resources.
 - (c) Consideration of relationship between hygiene and good health and results in better living.

Economic Aspects of Family Life

1. Overall budgeting.
2. Good food values.
3. Use of public resources.
4. Food handling, storage, preparation, and serving.
5. Consideration of responsibilities toward family and accepting public assistance (taking material help is difficult, but a hungry family must be cared for).

Planning Field Trip

1. Selection of areas of city to be visited for purpose of comparing selves with better and poorer sections and public housing areas.
2. Reconsideration of original offenses and correcting them.
3. Comparison of advantages of private and public ownership.

Field Trip

1. Visits to Tyson Street, Johannsen Street, Walbrook, Gwynns Falls Parkway, Newington Avenue, and Worsley Street areas, representing different types of residential neighborhoods.
2. Discussion en route of accomplishments, handicaps, and goals.
3. Emphasis on possibilities in use of personal initiative and resources.

Community Resources: Recapitulation and Evaluation

1. Self and family, neighborhood, broader community.
2. Reaffirmation by group of values of learning and participation in group.
3. Closing talk and presentation of "diplomas."

come when full reinspections are made a year or more after the defendants have completed the course. If the results at that time are favorable, the difficult next step will be to expand the course facilities on a scale that will reach thousands rather than hundreds of slum dwellers.

In May 1961, the bureau of urban renewal and housing authority took over the housing clinic, relieving the magistrate of the housing court of the responsibility for operating it. The bureau now supplies the staff and funds and is continuing the clinic just as it has been conducted in the past. The magistrate continues to refer people to the course.

For the future two suggestions for expanding

the clinic, which seem to have considerable merit, are being considered. One is to offer it as a free course in the public night schools in depressed areas and encourage attendance through such media as neighborhood improvement associations, police department, sanitation officers, churches, and newspapers.

The second idea is to give police and building inspectors the right to issue admission slips to the clinic instead of a summons to the housing court when they believe it would help the violator and he agrees to attend.

The effects of the clinic to date have been so encouraging that we feel we can begin to hope that it may become a new weapon in the war against slums.

Education Note

Research in Medical Care. The program of graduate training in research on the organization and financing of personal health services is in its second year at the University of Michigan.

Graduate research assistantships are available to a limited number of graduate students pursuing advanced degrees in public health, social work, economics, sociology, and other social sciences as a part of the research program of the university's bureau of public health economics.

Academic appointments as research assistant are made annually on a half-time basis with a beginning stipend of \$2,150 for the academic year. They are renewable, pending review of the student's performance and academic standing.

Predoctoral fellowships are available to assist students with their doctoral dissertations. Research assistants who have participated in

the research training program, as well as other predoctoral students who are planning dissertations on topics relevant to medical care, are eligible.

A program leading to the Ph.D. degree in public health economics is also offered in the bureau. It is intended primarily for those interested in a research and teaching career in medical care.

Additional information may be obtained from Dr. S. J. Axelrod, Director, Bureau of Public Health Economics, School of Public Health, University of Michigan, Ann Arbor.

Biomedical Engineering. A program leading to a doctoral degree in biomedical engineering will be initiated at Johns Hopkins University, Baltimore, in the fall of 1961. It will combine, for the first time, advanced training in engineering subjects particularly pertinent to research in biological systems with systematic study of the application of principles of physical and engineering sciences to biological systems. The University of Pennsylvania and the University of Rochester are cooperating with Johns Hopkins in establishing similar programs.

Program Notes

The Public Health Service awarded special citations to 20 U.S. steamship lines and 12 railroads in 1960 for maintaining high standards in sanitation. Each of these companies operates six or more conveyances. Letters of commendation were awarded to 24 smaller carrier companies. Ships and railroads are scored on more than 100 items in the PHS surveys.

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An institute on nutrition for the chronically ill and the aged will be held August 28-September 1, 1961, at the University of North Carolina in Chapel Hill, N.C. The program of speeches and group discussions is sponsored by the North Carolina State Board of Health, the Public Health Service, and the University of North Carolina. Information about the institute is available from Rebecca A. Broach, School of Public Health, University of North Carolina.

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The citizens of St. Joseph, Mo., passed a \$5,955,000 bond issue for construction of sewage treatment facilities, registering a major triumph for the Federal-State program to clean up the Missouri River.

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Pamphlets, films, and exhibits on ways housekeeping and child care tasks can be adapted to the limitations of the physically handicapped homemaker have been announced by the School of Home Economics, University of Connecticut, Storrs, Conn. Information about these materials is available from the school.

« »

The medical and osteopathic associations in California voted in May 1961 for a merger of the two professions in that State. Under the merger, the osteopathic schools and hospitals would be in the same categories as conventional medical schools and hospitals. All trainees would receive the one M.D. degree.

Dr. Warren L. Bostick, president of the California Medical Associa-

tion, said of the merger: "Unification is intended to remove any distinction among the individuals practicing medicine and surgery that is not related to skill and ability, to make available to the public efficient and adequate hospital facilities, and to improve the educational facilities available for the practice of medicine and surgery."

Later in the same month, the Philadelphia County Medical Society recommended that its members be "permitted to cooperate fully with the members of the Philadelphia County Osteopathic Society without fear of censorship." They also recommended that qualified osteopaths be admitted to the staff and facilities of all Philadelphia hospitals that are directed by doctors of medicine.

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A conference on the development of safe medicine chests and safety cabinets was held by representatives of manufacturers and public health on March 8, 1961, in Washington, D.C. A draft of standards for medicine chests will soon be considered for acceptance by the entire industry. At least three companies are producing chests designed after a model developed by the Public Health Service. Seals to be placed on chests meeting approved specifications and on "child-safe" cabinets were displayed at the meeting.

« »

H. J. Anslinger, U.S. Commissioner of Narcotics, reports that the number of known new narcotic addicts in 1960 was 7,479, which is 1,858 fewer than the number for 1956. The percentage of addicts under 21 years of age dropped from 12 in 1956 to 3.9 in 1960. Of all the Nation's addicts, 46 percent are in New York, 16 percent in California.

Anslinger advocates the building of community facilities, similar to the Federal hospitals at Lexington, Ky., and Fort Worth, Tex., for treatment and rehabilitation of addicts. A new hospital of this kind is under construction in New Jersey.

All 1962 cars will have attachments for front-seat belts. The automobile industry's announcement followed a conference between industry representatives and State Senator Edward Speno, chairman of the New York State Joint Legislative Committee on Motor Vehicles and Traffic Safety.

Legislation on seat belts had been introduced into 10 State legislatures by March 1961. The legislation ranged from urging automobile manufacturers to "consider suitable attachments" to requirement of seat belts on all new cars after a certain date.

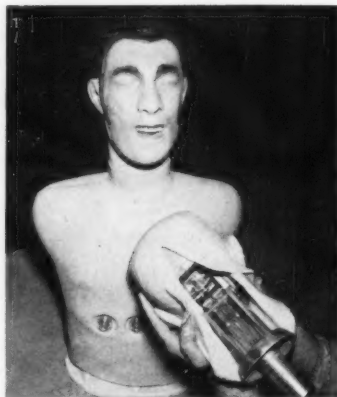
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The first students to complete a training course for prospective aides in homes for the aged at the Hayward Adult and Technical School, Hayward, Calif., were graduated in May 1960.

The methodology, course content, and materials used in the program are described in a pamphlet published by the California State Department of Social Welfare, 722 Capitol Avenue, Sacramento 14, Calif.

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A life-size manikin with a "breathing" apparatus, fleshlike plastic covering and the facial expression of a man in a state of shock from suffocation is being used to train students in the technique of mouth-to-mouth artificial respiration and other methods of resuscitation. Plastic valves prevent the dummy's lung from inflating unless the head is positioned properly by the student.



Medicine and Public Health in China Today

WILLIAM Y. CHEN, M.D., M.P.H.

SINCE CHINA is a great country with a population of more than 600 million and a territory as big as the United States, its accomplishments in medicine and public health during the last 10 years are worthy of study. To cope with the demand of national industrialization and reconstruction, much attention has been paid to public health and medicine in an effort to prevent disease and promote health and thus increase productivity. Since public health practice is closely related to political systems and governmental structures, in addition to indicating actual achievements, it serves as an indirect reflection of the political and socioeconomic status of present-day China.

The main sources of the information in this article are various medical and public health journals published in Chinese and English during the past 10 years. The *Chinese Medical Journal* of the Chinese Medical Association has a complete English edition. Also, many journals of the various medical specialties print English abstracts. English translations of scattered articles from original Chinese medical publications have been published by the U.S. Department of Commerce in the past 2 years. They are valuable to scientists interested in the details of research in specific fields.

It is the primary intention of the author to evaluate critically achievements in medicine

and public health in China during the past decade rather than review the literature. Also, I will emphasize achievements and new developments unfamiliar to the Western World and the future trends of medicine and public health in China. Most Chinese and English language publications issued in China have been reviewed as well as reports from non-Chinese sources.

Conditions in Pre-Communist China

To understand medicine and public health in China today, it will be helpful to examine briefly the situation in these fields in pre-Communist China.

Before the Communist regime took control in 1949, medicine and public health were far below modern standards. Poverty was widespread and diseases raged the country. For example, the general mortality rate in Peking was as high as 14.1 per 1,000. More than 75 percent of the population was illiterate. The total number of scientifically trained physicians was estimated to be 12,000 in about 500 hospitals; the country's medical schools were capable of producing only 500 graduates per year for an estimated population of 400 million.

In "China's Health Problems," published in 1944, Sze (1) described China's plans to combat the excessive mortality of 4 million a year caused by infectious and parasitic diseases and to provide the necessary facilities for the daily treatment of about 60 million patients. Because 84 percent of the total population in the rural areas was incapable of paying for private medical care, the only early solution was believed to be a system of state or socialized medicine as planned by Lim and Chen (2).

As early as 1939 a new Hsien or county health center system was started, and by the end

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of World War II, there were some 1,775 county health centers, 26 provincial medical centers, 125 provincial hospitals, and 307 missionary and other private hospitals. There were 15 national, 5 provincial, and 10 private medical colleges, 5 pharmacological schools, 3 dental schools, 22 midwifery schools, and 317 nursing schools. The county health center is comparable to the county health department in the United States, but preventive medicine, public health, and medical care are combined under one governmental authority differing from the U.S. system. Generally, its functions are general administration, medical care, epidemic prevention, environmental sanitation, maternal and child health, health education, and vital statistics.

China was more unified organizationally after V-J Day, and a centralized national government exercised its authority over health matters in all Provinces more strongly than before. The county health center system was planned, shaped, and conducted mostly by U.S.-trained physicians; many of them still live in China and, in fact form the backbone of China's medical and health structure.

In "Western Medicine in Pre-Communist China" (3) Grant gives a brief but precise history and background of Western medicine in China during the last half-century. American influence in the development of Western medicine was particularly strong. The Rockefeller Foundation organized a China Medical Board in New York City in 1915 and supported the well-known Peking Union Medical College. During World War II, China owed much of its development of medical relief and educational work to the American Bureau for Medical Aid to China. A conference on the medical situation in 1946 was called by this organization with the aim of furthering the medical reconstruction of China after the war. Ambitious national health and medical education programs in the form of 5-, 10-, and 30-year plans were worked out in detail by the Chinese medical and health leaders (4).

Medical Education in Communist China

Owing to the shortage of physicians and other medical personnel, emphasis on medical educa-

tion in the past 10 years has been on quantity rather than quality. It is claimed that during the last decade more than 40,000 graduates came out of medical and pharmacological schools. This number is nearly four times the total graduates from 1928 to 1947. Graduates from secondary medical schools and secondary public health schools, which provide 2 to 3 years' training, numbered more than 153,000. Various auxiliary educational methods have been used to increase the training of such workers. In tune with the national policy that education should serve the working people, much political training was enforced in medical schools, perhaps to the point of being detrimental to scientific training.

It is a tremendous undertaking to train enough physicians and to establish enough hospitals to cope with the needs of a huge population like China's. A basis of only 1 doctor per 1,500 population requires 266,000 doctors for the 400 million population estimated before Communist rule. For a minimum of 5 hospital beds per 1,000 population, 2 million hospital beds would be required. With a population of 600 million today, as claimed by the Communist government, these numbers should be increased 30 percent. Even the United States is confronted with a shortage of physicians, and some top-grade medical schools have started new programs to shorten the training and reduce the cost of tuition. It is easy to understand why the Communists have preferred mass production rather than individual craftsmanship.

The quality of medical education has been little emphasized during this past 10 years. This has been a source of constant criticism by visitors to China and has promulgated the idea that the Communist government has sacrificed quality for quantity. Some even see a danger of scientific retrogression (5). Although the idea of quantity versus quality is subject to argument, the fact remains that much progress has been achieved in preventive medicine and public health. The test of the validity of the criticism will be whether the government follows its original theme of mass production or, realizing the shortcomings, changes direction. The universally applied slogan in Communist China has been to do everything "by leaps and bounds and doing everything whole-heartedly,

aiming higher with greater objectives to obtain quicker, better, and more economical results" (6).

In 1960 it was announced in the *Chinese Medical Journal* that a new college, China Medical College, has been established in Peking. It will offer an 8-year medical course instead of short-term training. The curriculum consists of 3 years devoted to basic sciences, 2 years of basic medical knowledge, 2 years of clinical medicine, and 1 year of practical field experience. English and Russian are the compulsory languages. Many senior research specialists of the Chinese Academy of Medical Sciences and professors of the former Peking Union Medical College will be on the staff. The establishment of this new 8-year medical college is evidence of a realization of the importance of quality as well as quantity.

Among other examples are the achievements of the Chinese Medical Association. The association existed in Nanking 40 years ago; under the Communist regime it was moved to Peking. Membership increased from 4,000 in pre-Communist days to 18,472 by the end of 1958. There are 16 professional societies within the association, and it has 54 branch associations throughout the country. Its activities have increased yearly, and many important national conferences have been sponsored jointly with the Ministry of Health.

At the association's headquarters, a five-story building in Peking built in 1957, is a sizable medical library. Publication of medical journals and books is also an important function; 25 major medical journals are now being issued, and more than 1,200,000 copies are circulated. It has been reported that 422 journals in 30 countries have exchange agreements with the association. Medical research has also been encouraged by the association and will be discussed later (7).

Integrating Traditional and Western Medicine

To cope with the task that faced them, the Communists desperately needed medical manpower. One realistic way to accomplish this was to use the "traditional" Chinese physicians, reported to number about 370,000, throughout the country. These practitioners are not scientifically trained. They treat patients empir-

ically using native herbs and drugs and healing methods based upon old Chinese medical theories. The modern Chinese physicians frowned on the methods of the traditionalists, and many difficulties ensued because of their objections. Yet the Communist government was determined to utilize these practitioners and the Vice-Minister of Health, Hsu Yun-Pei, reemphasized the need for "cooperation between traditional Chinese and Western medicine to promote people's health" (8). He stated, "The Chinese Communist Party has always advocated the unity of traditional Chinese medicine and Western medicine in order to fully develop the medical heritage and to advance medical science in China." Repeatedly emphasized was the long history of medicine in China, beginning with the Chinese Canon of Medicine (The Nei Ching) published in 200 B.C. Since then, several thousand volumes of Chinese medical writings have been handed down from generation to generation, thousands of Chinese herbs and drugs have been in use for several thousand years, and empirical physical treatments, such as acupuncture, moxibustion, massage, and breathing exercises have been widely practiced for centuries.

At the end of 1958 the Ministry of Health officially enforced the full-time study of Chinese traditional medicine by Western-trained Chinese physicians. By the end of 1959, 2,100 modern physicians were enrolled in 30 full-time classes to study traditional medicine. In addition, many institutes and schools of traditional Chinese medicine were established to train new traditional practitioners who were simultaneously instructed in scientific medicine. In 1958, 3,200 such students were graduated. A department of traditional Chinese medicine has been established in most of the larger hospitals, and a considerable number of traditional physicians are on the staffs of county and commune hospitals. The integration of traditional medicine and Western medicine is growing stronger rather than weaker. Whether this will result in the deterioration of the quality of medical education in China remains to be seen.

Practical Field Education

Following the general educational policy of going to the countryside, all professional teach-

ers and students must go to the rural areas and factories to work with the farmers and workers to gain practical field experience (9). In general, during every school calendar year, 38 weeks are earmarked for teaching, 6 weeks for vacation and holidays, and 8 weeks for practical fieldwork. The students and teachers must live and labor with their patients, eat the same food, and live the same lives. The Communist government feels that this field movement is the best way to make the medical workers serve the people so that productivity is promoted and the commune system strengthened. This step substantially corrected the concentration of medical personnel in the big cities, a phenomenon also common in most countries of the free world today. There is a question whether such compulsory regimentation of doctors will prove to serve the people better than our system of free doctor-patient choice.

Publication of Medical Books and Journals

Since 1953 all important medical books and journals have been published by the People's Medical Publishers in Peking. There are 77 different medical and health periodicals currently published throughout the country. The *Chinese Medical Journal* is issued monthly in Chinese and English editions. The monthly editions of the *Chinese Journal of Internal Medicine* and *Chinese Journal of Surgery* have English abstracts. The bimonthly *Chinese Journal of Pediatrics*, *Chinese Journal of Ophthalmology*, *Chinese Journal of Dermatology*, *Chinese Journal of Radiology*, and the *Chinese Journal of Neurology and Psychiatry* and the quarterly *Chinese Journal of Pathology* all print English abstracts. Two monthly English scientific publications, *Scientia Sinica* and *Science Record*, and eight different *Acta Experimentalis in Biologica Sinica* are published quarterly by the Chinese Academy of Medical Sciences. The Central Research Institute of Health prepares the widely read monthly, *People's Health*, which was formerly part of the *Chinese Medical Journal*. The National Library of Medicine, Public Health Service, has a sizable collection of such periodicals available for reference.

Progress in Medicine

Improvement of sanitation and health education and prevention and control of common infectious and parasitic diseases have been reported (6,8,10). It is claimed that public health and clinical medicine have caused the total disappearance of cholera in China and that plague and smallpox have been eradicated. Typhus, relapsing fever, and other "notifiable" or "reportable" infectious diseases have been brought under control.

Infectious and Parasitic Diseases

Great improvements have been made in the control of major parasitic diseases. At one time 10 million persons had schistosomiasis. It has been reported that 4 million of these have been cured, and many areas have been freed from such a disease. Various immunological tests have been developed and applied widely in the diagnosis of schistosomiasis. Among those reported are the intradermal reaction test with adult worm antigen or liver-ova antigen, complement fixation test, cercarial membrane reaction, circumoval precipitate reaction, and carmine flocculation reactions. A 3-day short course antimonial treatment has been widely used without increase of toxicity. The morbidity rate of schistosomiasis dwarfism is reported to be about 4 percent, and its clinical manifestations correspond to those of pituitary dwarfism. Ectopic schistosomiasis lung lesions are observed in more than 76 percent of acute cases and in 9.1 percent in late stages (11).

Millions of malaria patients have been treated, and the incidence rate has dropped to a level of less than 3 percent. A single dose of 0.4 gm. of quinacrine hydrochloride plus 0.04 gm. of plasmoquine given to 100,000 patients is reported to be both practical and effective. Other new Western antimalarial drugs and a native herb, *Orixa japonica* Thunb., have been utilized with good results (12).

Filariasis has been practically eradicated from 38 districts and municipalities and 2,600,000 patients have been cured. A short-course treatment with a single dose of 1 gm. of diethylcarbamazine has been reported effective (13). The number of kala-azar patients has dropped from 530,000 to 10,000 within the last

10 years. Hookworm infection (ancylostomiasis) is still widespread in the country. Reportedly, more than 36 million patients have been cured.

Knowledge of paragonimiasis as a systemic disease has been advanced, and the study of the pathology of this disease has proved that the pathway of the parasites to the brain is along the connective tissue around the blood vessels of the neck (14,15). Some comprehensive reports and abstracts from the All-China Conference on Parasitic Diseases were published in the January, February, and March 1959 issues of the *Chinese Medical Journal*.

As a result of the proper practice of personal hygiene and effective treatment, syphilis and gonorrhea are no longer menaces to health (16). An analysis of 103 cases of syphilitic juxta-articular nodes between 1954 and 1958 indicated that such a condition is not rare in China (17).

Japanese B encephalitis has been studied extensively. Many strains of the virus have been isolated in various parts of China. Vector-mosquitoes as well as hoofed animals are considered to be permanent hosts. Virus has been found in and successfully transmitted from mosquito ova. Under experimental conditions, Japanese B encephalitis virus lived in the body of hibernating mosquitoes for more than 164 days (18). Treating Japanese B encephalitis with traditional Chinese medicine has been claimed to be better than modern therapy (19).

Much research has been devoted to influenza in the past few years, especially after the 1957 epidemic. An All-China Influenza Conference was called, and one central and several regional influenza research laboratories were established in 1957. Many strains of virus were isolated and identified as Asian type A during that epidemic. According to available data, the epidemic appeared to have started at Yunnan-Kweichow border in southwestern China. Poliovirus, adenoviruses, and Coxsackie virus also have been isolated and studied.

Cardiovascular and Renal Diseases

The relative prevalence of rheumatic heart diseases is the highest (30 to 50 percent) of all organic cardiovascular diseases. Hyper-

tensive heart disease ranks next, 20.1 to 20.3 percent, while arteriosclerotic heart disease constitutes only 4.6 to 15.5 percent (20). Investigation of population samples in Peking showed that the prevalence of hypertension was about 5 to 6 percent. A number of Chinese herbs and acupuncture therapy have been tried in the treatment of hypertension and reported to have had good effect.

A particular heart disease, "Keshan disease" (7), reported in 20 percent of the people in an area with a population of 2,000, was investigated. Clinically, this disease is similar to cardiac insufficiency or serious ventricular arrhythmia, and pathologically it has the signs of multiple foci of new and old myocardial infarction.

Diseases of the Digestive System

Infectious hepatitis has been the subject of much investigation. Material from a fairly extensive number of autopsies in Canton showed that postnecrotic cirrhosis constitutes 23.6 percent of the clinical cases of cirrhosis of the liver (21). Recently some preliminary success has been reported on the isolation of infectious hepatitis virus using chick embryo (18). For palliative treatment of ascites in cirrhosis of the liver, a combination of Western medical treatment and traditional Chinese medicine has reportedly kept many patients free from abdominal fluid for as long as 18 months (22). Cholecystitis and cholelithiasis have been seen frequently among younger age groups in China but show less sex ratio difference than in the U.S. The ratio between male and female is 1 to 1.2 (23). Even ascaris is commonly seen in the biliary tract, representing 10 to 45 percent of all surgical cases of biliary diseases (24).

Diseases of the Respiratory System

Among the diseases of the respiratory system, pulmonary tuberculosis is still the most common, although the mortality rate has dropped rapidly. For example, in Peking tuberculosis mortality rates declined from 230 per 100,000 in 1949 to 46 per 100,000 in 1958. Treatment by traditional Chinese medicine in combination with modern drugs has been tried extensively,

reportedly with good results. Bronchial asthma has been treated with several herbal drugs (25).

Endocrine and Metabolic Diseases

Goiter is an important endemic disease in China. Surveys have been extensive and preventive measures have been taken. In addition to the deficiency of iodine in the diet, high-calcium and low-magnesium content in the drinking water from two endemic areas has been noticed (26).

A form of endemic deformative osteoarthritis called "big joint disease" has been reported in a number of northeastern and northwestern districts. It was believed to be Kaschin-Beck disease or Uroff disease. The etiology of this condition is still under study and a theory of dietary fungus intoxication has been suggested (27).

Occupational Diseases

Extensive medical and industrial health efforts have been devoted to checking widely prevalent silicosis, and the literature indicates considerable progress in diagnosis and treatment. Studies have been conducted to discover early neurological manifestations as a clue to early diagnosis. These include the disturbance of the ability to taste sweetness, functional deficit in the pain threshold, and lowering of the protective inhibitions. Many cases of silicosis have been detected by these early signs before radiological examinations can be made (28).

Surgery

Progress in surgery has been rather slow. During the past 10 years China has concentrated on establishing surgical facilities in many hospitals. However, many surgeons have acquired considerable experience in modern surgical techniques. Anesthesiology has become a well-recognized specialty, and new techniques have been adopted. It has been reported that in a series of 1,785 cases of acute perforation of gastroduodenal ulcer, 38.2 percent were treated by gastric resection with a mortality rate of only 2.6 percent and an ulcer-recurring rate of 2.4 percent (29).

Acute pancreatitis is not rare in China and ranks fourth, after acute appendicitis, acute

intestinal obstruction, and acute perforation, in frequency among abdominal surgical emergencies (30, 31).

Thoracic surgeons in China have made several modifications in the technique of thoracoplasty. A costoverision and refixation of two resected ribs in a cross form has been reported (32). Transpleural approach in radical treatment of tuberculosis of the thoracic spine has been reported to be effective and successful (33).

In a series of 100 cases of pulmonary resection of chronic lung abscesses, a vascular murmur was heard over the chest wall opposite the lung abscess in some of the cases. In subsequent pathological examinations the cause of the murmur was found to be the normal blood flow from the pulmonary vascular system through the dilated blood vessels in the pleural adhesions (34).

Progress in cardiovascular surgery, as well as cardiology, has been rapid. Operations such as mitral commissurotomy, pericardiectomy, and ligation of patent ductus arteriosus are practiced in most medical college hospitals and provincial hospitals. Direct vision intracardiac operations and transplantations with preserved or artificial blood vessels are performed in increasing frequency at a number of medical centers (35).

As a result of saving the life of one man whose severe burns covered 89.3 percent of his body surface, great enthusiasm has been engendered for improving the treatment of burns. Reportedly, many more lives have been saved by emphasizing proper management, restoring the balance of water and electrolytes, and preventing wound infection (36, 37).

Pathology

A detailed report on the progress in morphological pathology was published by Hu and Yang in the *Chinese Medical Journal* (38). They discussed the pathology of infectious hepatitis, tuberculosis, schistosomiasis, clonorchiasis, paragonimiasis, silicosis, and Keshan disease.

Liang at the Chung Shan Medical College in Canton (39) investigated the etiology and morphological pathology of primary liver carcinoma. He found that the occurrence of

this condition among the Chinese, whether calculated on the basis of all autopsies performed (11.9 percent) or autopsies of those with cancer (26.2 percent), was more frequent than the respective occurrence for Europe and the United States. The Chinese develop primary liver carcinoma at an earlier age than do Europeans and Americans. The average age reported for the Chinese was between 30 and 49 years.

Microbiology

A comprehensive study on the etiology of trachoma by Tang and co-workers is of interest to microbiologists (40). They report that virus is the likely etiological agent and that the transmission of this disease from human beings to rhesus monkeys by direct inoculation with conjunctival scrapings is possible. Also, the passage of infected materials in series was attempted. Further studies on the morphological changes of trachoma inclusion bodies under the influence of chlortetracycline, chloramphenicol, and streptomycin have been conducted by Yeh and Tang (41). In 1958 Tang and associates found the first strain of measles virus isolated in China (42).

A hitherto undescribed virus latent in white mice was discovered by Chu and co-workers (43). Also, achievements in general virology and tissue culture have been attained by Kau Shan-Yin and associates (44). Recently many studies on streptomyces have been recorded, including serologic methods for their classification (45).

Some progress also has been noticed in other fields such as neurology (46), obstetrics and gynecology (47), radiology (48), and otolaryngology (49).

Traditional Chinese Medicine

Traditional Chinese medicine is an empirical healing art based on 4,000 years of practical experience. Its theory of disease is simple and medieval. Its concept of health and disease is the functional bodily harmony or disharmony between two forces, yin (the negative) and yang (the positive). Anatomically and physiologically, traditional Chinese medicine has practically nothing to offer, yet the vast

volumes of herbs and drugs and the medical treatises recording observations of diseases are precious. The results of treatment with these drugs and the healing art of acupuncture, moxibustion, massage, and breathing therapy have an empirical value. Discussion of Chinese herbs and drugs is in the realm of pharmacology, and only acupuncture, which is a controversial subject, will be discussed here.

Acupuncture, a healing art peculiar to China, was practiced as early as 200 B.C. (50). It consists of the introduction of hot and cold needles into the body at specific points. The needles may be fine or coarse, short or long (3 to 24 cm.).

Application is based upon the old Chinese medical theory that internal organs and various parts of the body are intimately related and work in harmony for the maintenance of health. These organs and body parts are hypothetically connected by 12 channels (Ching). When the needles puncture and stimulate different tissues or organs at various depths, they cause physiological reactions and thus produce healing results. Practicing acupuncture in ancient times was dangerous owing to ignorance of aseptic techniques and the lack of anatomical knowledge.

Acupuncture was carried from China to Japan at an early period but was not introduced to Europe until later. At one time it created considerable interest in Europe, especially in France. François de Remusat published a long analysis for and against this practice at the beginning of the last century. Later Sir James Cantlie tried it successfully in several cases of rheumatism and sprains. Morant and Ferroyrolles contributed a review of its history and application (50).

In 1956 the Russians sent a group of physicians to Peking to study the art of acupuncture. At present intensive studies on the unknown mechanism of acupuncture are being conducted in Moscow by Soviet and Chinese physicians. The hypothesis is that stimulation from punctures is conducted from the peripheral nerves to the brain cortex and suppresses the pathological irritation in the brain. Such explanation seems to be in harmony with the Pavlov theory of conditioned reflex.

Acupuncture has been widely used for prac-

tically all kinds of diseases ranging from surgical conditions such as appendicitis to chronic conditions such as diabetes. It is believed that it produces best results in illnesses of the nervous system or those of neurological origin. Good results have been reported in the treatment of facial paralysis, arthritis, eczema, and other conditions.

One Russian physician reported that his long painful arthritis was much improved by acupuncture (51). A physician from India who studied acupuncture in China in 1958 entertained certain doubts as to its value at first. However, he later believed that the integration of traditional medicine and Western medicine had already accomplished remarkable successes. He was also treated successfully by acupuncture for acute sinusitis (52).

Dr. Wu Lien-Teh, the great plague fighter (53) during the severe Manchurian epidemic half a century ago, said in the preface to "History of Chinese Medicine" (50) that "Chinese medicine, to be understood and its significance appreciated, must be studied as a whole. In no other field of endeavor in this country has the experimental method realized such concrete and far-reaching results as in the domain of medicine."

Whether the Communists will succeed in their ambitious endeavor to produce a new Chinese medical science by incorporating traditional medicine with modern scientific medicine only time can tell. Whatever the outcome, this development is worthy of constant attention.

Preventive Medicine and Sanitation

Most visitors have noticed that China has achieved great successes in preventive medicine and sanitation in stamping out many major infectious and parasitic diseases during the past 10 years. This resulted, for example, in the decline of the general mortality rate in Peking from 14.1 to 7.4 per 1,000 during this period.

The first step was a campaign to eliminate the four major pests, mosquitoes, flies, rats, and grain-eating sparrows. They integrated public health with mass action by what was called the "patriotic health movement." Throughout the country millions of people, including the aged and the very young as well as the workers, were

mobilized to kill the four pests. They used all available antivermin chemicals and devices, swatted mosquitoes and flies with their hands, and threw sticks and stones at rats and sparrows.

Reportedly, more than a billion sparrows, 1½ billion rats, 100 million kilograms of flies, and 11 million kilograms of mosquitoes were eliminated in 1959. It was humorously reported that many sparrows, constantly chased by the people hour after hour, finally died of sheer exhaustion. Many visitors today are surprised that these pests have practically disappeared from China.

It must be pointed out that such concerted mass action was possible through effective enforcement of police power and the voluntary cooperation of the people. In such campaigns, families in each block or ward in a city formed their own groups and elected a group leader for the street committee. Under the chairmanship of a member from the local district council, the street committee served as the basic unit in carrying out the government orders concerning public health and other matters, such as education, welfare, security, and arbitration between neighbors. The committee chairman also represented the voice of the people to the government. The two-way public representation was believed to be the real reason for the success of this battle (5).

The improvement of general environmental sanitation and the practice of personal hygiene, both in the cities and the rural areas, is also phenomenal. Swampy parts of rivers and streams have been drained and irrigation improved. Countless old refuse dumps and stagnant pools have been transformed into parks and recreational areas throughout the country. China is also reconstructing slums. Much attention is being given to research on various public health problems ranging from the disinfection of well water and the washing and cooking of vegetables to the effect of heat on factory workers and climatic influence on infant mortality (54).

Philosophy of Medical Care

The practice of medical care in China today may be said to be a modification of the social-

ized medicine of the Soviet Union. However, patients do pay small fees to hospitals, clinics, or health centers. Usually very small fees are charged for physicians' services and more substantial ones for expensive drugs, X-rays, and surgery. The trend, already apparent among the so-called "privileged groups" in most cities, is to provide more hospitals and clinics in order to give more free medical care to the people. China is reported to have 300,000 hospitals and clinics with more than 400,000 hospital beds and 1,400 anti-epidemic stations. Recently it has been claimed that 700,000 industrial workers, 360,000 teachers, and university students and government workers in Peking alone are receiving free medical services. In Shanghai the same privilege has been given to 1,160,000 workers, 280,000 teachers, and students and government workers. More than 1 million dependents of factory workers pay only half of their medical expenses.

Obviously physicians in China do not have freedom of medical practice. All physicians, nurses, technicians, sanitarians, and other health workers are government employees and are paid set salaries by the hospitals or health agencies. Although private practice still exists in some big cities, the scope is negligible. Government regulations restricting fees make it impossible for practitioners to earn greater incomes than the government salaries.

In various city and country resorts hundreds of sanitariums are now available free of charge for privileged groups (55).

Three-Level System

The medical care system is divided into three levels (5). The primary level of medical care consists of the municipal clinics in cities and the county health centers in rural areas. Patients are seen by modern medical or traditional physicians for general diagnoses and primary treatment during three 8-hour shifts. When physicians are not immediately available for house calls, nursing aides or health aides administer emergency first aid in the villages.

At the secondary level, medical care is given at better staffed and better equipped county or district hospitals. These hospitals have a bed capacity of between 200 to 300 to handle specific medical or surgical cases.

The third level of medical care consists of highly specialized hospitals or health institutions operated by large municipalities, provincial governments, or medical colleges, similar to big medical centers in the United States. The general public health responsibility at this level rests with the health departments of the Provinces or special municipalities. These agencies are under the direction of the Ministry of Health of the Central Government.

Medical Care in a People's Commune

The Communists believe in a commune system that is an integrated organization of workers, farmers, merchants, students, and soldiers. These people are organized into militia to meet any military emergency and into production brigades to attain the quota set for national reconstruction. Within the commune system are medical and health installations, mess halls, kindergartens, nurseries, gynecologic and obstetric hospitals, and institutes for the reverence of the aged. The Communists are determined to convert by force if necessary their ideal of a commune system into total socialization.

To see the trends in the medical care system in China, it will be helpful to consider an example of a typical people's commune (56). In the rather hilly countryside of north China, is Mee Hsien, a county which has recently developed into a prosperous coal-mining area with various small industries. It is composed of seven communes of various sizes. One commune has a population of 40,121 divided into 17 production brigades. Each production brigade is subdivided into 4 to 10 production regiments in the various villages.

Each people's commune has a managing council which controls all production brigades and supervises the medical and health agencies. These agencies include a commune health center clinic with several health stations, obstetric clinics, and many health aides, nursing aides, and obstetric aides (see chart).

The commune health center clinic has a staff of 43, 9 modern and 7 traditional physicians, 10 nurses, 11 technicians, 3 administrators, 2 public health personnel, and 1 maternal care nurse. There are 25 hospital beds at the clinic, a ratio of 0.6 beds per 1,000 population.

Each of the 17 production brigades in the commune has a health station. The health station is under the administrative direction of the commanding officer of the brigade, with the director of the health center clinic having only technical responsibility. There are 3 or 4 modern or traditional physicians at each station. They serve an area with a 3- to 4-mile radius covering 8 to 10 villages, provide outpatient care at the station, and make emergency house visits.

One nurse at each health center clinic is responsible for maternal and child health within the commune system. Each production brigade has one obstetric clinic with an experienced obstetric aide to assist the physicians. At present it is claimed that 60 percent of all infants are delivered by scientific methods. In the larger cities this number is reported to be as high as 98 percent (57).

The need for nurseries and kindergartens depends upon the seasonal employment of mothers. Usually, during busy seasons of the year, many temporary nurseries are established. Each production regiment has its own health aides, nursing aides, and obstetric aides working under the supervision of the doctors and nurses.

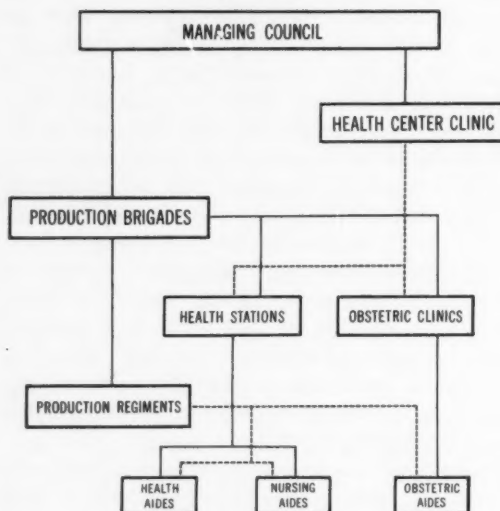
All patients are charged nominal medical fees at the health center clinic which is supported by the whole commune. Charges for services given by the health stations vary with the productivity of the production brigades. Usually the patients pay 30 to 50 percent of the cost of medicines.

The medical organization in a commune is analogous to a basic unit in an army medical corps. However, with the shortage of medical personnel and the inadequacy of medical facilities, it appears that a socialized medical system is still far from successful.

Central Research Institute of Health

In 1950 the former Central Health Experimental Institute in Nanking was reorganized into the Central Research Institute of Health and moved to Peking (58). Devoted to research directly or indirectly related to people's health, it consists of six departments: microbiology, sanitary engineering, nutrition, pathology, pharmacology, and Chinese herbs.

Basic medical and health organizations of a people's commune



Its branch institute in Nanking investigates parasitic diseases and a branch institute in Hainan Island studies malaria. Currently there is a staff of more than 250 scientific research workers.

The department of sanitary engineering is concentrating on problems of general sanitation and industrial ventilation and cooling. Many experiments have been conducted using natural raw materials as a source of insecticides such as DDT and 666. Investigations of various parasitic and infectious diseases, such as schistosomiasis and malaria, conducted or sponsored by the institute, have already been mentioned. The nutritional value, especially vitamin content, of wild vegetables and the potentialities of beans, rice, and other food-stuffs as milk substitutes have been studied intensively. Much pharmacological research has been devoted to synthetic production of native antimalarial and antituberculosis drugs. Recently the study of physiques has caught the interest of the institute staff in their efforts to promote better physical health and thus aid national defense and production.

Cancer Prevention and Control

The Communists have also realized the importance of preventing and controlling chronic

diseases. Recently they launched a vigorous cancer campaign (59). Although achievements in cancer research have not been of great significance, the scope of this disease in such a vast population warrants attention. Mass detection of cancer, especially of the uterus and cervix, esophagus, and nasopharyngeal cavity, was started in 1958, and more than 4 million people have been examined in 13 Provinces and cities.

Cancer of the cervix was most frequent: 90.8 percent of all cancer detected in Shanghai. Cancer of the esophagus was more prevalent in northern China than elsewhere, while cancer of the nasopharyngeal cavity was higher in the south (60). A detailed analysis revealed that the incidence rate for cancer of the esophagus among 3,100,000 persons surveyed in northern China in 1959 was 18.3 per 100,000 and the mortality rate was 16.2 per 100,000 (61). The Department of Pathology, Chinese Academy of Medical Sciences, has also made a statistical analysis of 13,779 surgical specimens seen during the last 40 years. The data showed that the percentage of esophageal cancer was 4.7 percent (62).

The Chinese have studied cancer of the liver intensively. Thirty-eight medical colleges reviewed 21,706 autopsies from January 1950 to June 1957 and found 1,979 tumors diagnosed as malignant. Liver cancer comprised 1.2 percent of all autopsies and 26.4 percent of all cancers (63).

In areas of northern China such as the Canton district, malignant cholangioma was considered probably related to the infection with clonorchiasis. In 200 cases of primary carcinoma of the liver, 46 were reportedly complicated by this infection with various stages of epithelial hyperplasia in the secondary intrahepatic ducts up to the development of cancer (64).

Bronchogenic carcinoma was reported to be 18.4 percent of all tumors found in autopsies. Some investigation on lung cancer-cigarette relationship has been conducted and led to the belief that cigarette smoking is not the only etiological factor. A high percentage of lung cancer occurred in permanent rural residents (65,66).

Among the tumors of the genitourinary sys-

tem, it was reported that, out of 27,149 cases of cancer studied, 4.6 percent occurred in the urinary system and male genital organs. Cancer of the bladder was found in 1.3 percent of 987 cancer autopsies. However, prostate cancer among the Chinese was reported to be rare. Among 28,884 cases of malignant tumors studied in Shanghai, only 16 were prostate cancer (67).

Medicine and Public Health in Taiwan

Although this is a report on Communist China, the accomplishments of the Chinese scientists in Taiwan or Formosa should also be mentioned. There are today more than 4,000 qualified physicians, 700 dentists, and 700 pharmacists registered in that tiny island with a population of a little more than 10 million and a total area of about 14,000 square miles. Many are migrants from the mainland.

They are conducting an excellent county health center system which was begun by the Nationalist Chinese Government when it moved to Formosa. At the present time, there are three medical schools on the island. They not only produce a sizable number of medical personnel but engage in various kinds of research, including study of diseases of obscure etiology and diseases among the aborigines. In cooperation with American universities and medical institutions, research activities have increased during the last few years (68).

Conclusion

In reviewing the progress of medicine and public health in China today, one of the most startling accomplishments is the prevention and control of many infectious and parasitic diseases which had ravaged that country for generations. The improvement of medical education in quantity, if not quality, has also been noted. However, other progress in medicine is not actually as rosy as the Communists' propaganda indicates.

The integration of traditional Chinese medicine with Western medicine is obviously being overdone, but at present no one is in a position to conclude that nothing of value or importance to medical science will result.

There is a great socioeconomic revolution going on in China among one-fourth of the world's population. No matter what the political outcome, the impact of this revolution on the philosophy and practice of medicine and public health should not pass unnoticed by the rest of the world. Although the enforcement of the commune system has met with much opposition inside China and received severe criticism abroad, its success or failure will naturally depend upon the benefits reaped by the people, including medical care. Since medical care for the aged is one of the urgent needs in the United States today, it should be no surprise that even the Communists are trying to find a solution.

It should be remembered that most senior physicians and medical scientists in Communist China today are either American-trained or have visited the United States on an exchange basis. For the most part, they are competent workers and thinkers and form the backbone of that Nation's medical service. They have great admiration for the advances and contributions of the United States to medical science.

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Investigation of Acute Gastroenteritis at a Popular Resort Area

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THE MILD "enteric disorders" so common in the summer and fall are among the most common and yet the most ill-defined groups of illnesses afflicting the American people. These diseases sweep communities, States, and entire sections of the Nation. Largely because of ignorance of their etiologies, they are known among laymen and physicians alike as "the flu" or "intestinal flu" or "acute gastroenteritis."

As better methods of medical, epidemiologic, and laboratory investigation have become available, many summer diarrheas have been proved to be caused by *Salmonella*, *Shigella*, and other bacteria. Only a small percentage are treated by physicians, and when treatment is instituted, it is symptomatic. However, physicians consider the etiology of most enteric disorders as unknown, probably viral. Their mode of transmission is also unknown, possibly person to person. Practicing physicians consider them to be self-limited, of short duration, and of mild nature. Perhaps, from a practical clinical viewpoint, that is all one needs to know.

Nevertheless, no human ailment, however mild, should be ignored. It is only through the study of a disease from the subclinical through the fatal stage that we come to understand its true biology and epidemiology and that we learn effectively to prevent or control its occurrence. For example, how is a mild case of gastroenteritis in John related to aseptic meningitis in Jimmy next door? This riddle is what

fascinates the epidemiologist. Yet, hampered by difficulties in case reporting, he is usually unable to make adequate studies.

Occasionally an outbreak of illness occurs which is so explosive and in which the cases are so closely associated that definitive epidemiologic study is possible. Such an outbreak occurred in the Seattle area in the summer of 1959. However, the numbers in the incident were small and laboratory diagnosis was limited. The following report may serve to place another piece in the jigsaw puzzle of "nonspecific enteric disease."

Background

On July 22, 1959, the Seattle-King County Department of Public Health was notified of the occurrence of acute gastroenteritis in 7 of 12 members of one family after a company picnic on July 18 at a well-known resort. The picnic was a potluck affair, with each family bringing food. Ice cream and soda pop were supplied by the company. The reporting family felt that other members of the party might also have become ill. Subsequent investigation revealed illness in at least three other company employees.

Six days later, on July 28, a mother reported gastrointestinal illness in 29 of 36 members of an exclusive girls' club following a weekend outing at the same resort, from Friday evening, July 24, to Sunday morning, July 26. The illness was so explosive and severe that the group's entire recreational program was abandoned. The girls stated that they had purchased food in Seattle and prepared it at the resort. Many

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of them complained that the water at the resort tasted bad and had a foul odor.

The epidemiology and sanitation divisions of the health department launched an immediate investigation.

Method of Investigation

A roster of the persons attending the outings and a complete menu of all foods consumed were obtained from both the girls' club and the company picnic group. Epidemiologic histories of members of both groups were obtained by telephone.

Health department personnel visited the resort on July 28 and 29. A list of all organizations using the area between July 18 and 26 was obtained from the owner. Information re-

garding illness, activities, and resort facilities used was obtained from the social chairman of each organization by telephone.

A sanitary survey of the resort area was also made. Stool specimens were requested from all girls reporting diarrhea. Four specimens were obtained. Water samples were obtained from the two water supplies on the premises and from the lake on which the swimming beach is located.

Findings

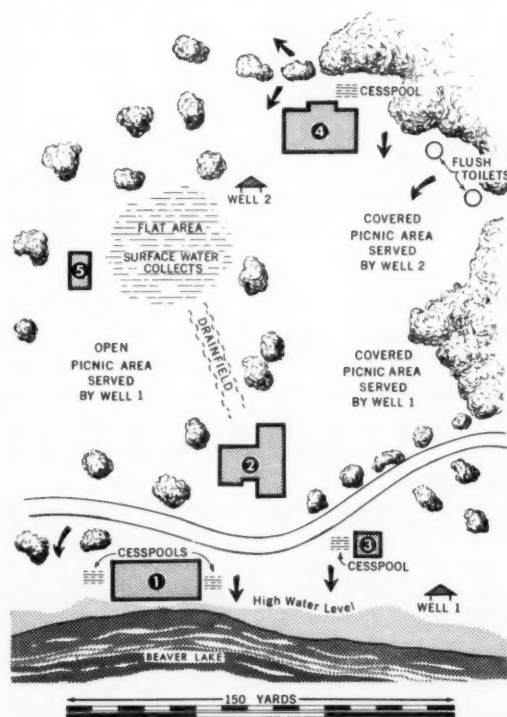
The resort is about 20 miles from Seattle, in a wooded area between two lakes. It is open the year round, but the period of greatest activity is summer. It caters to group picnics in addition to providing overnight cabin and dormitory facilities to organizations and vacationing families.

Facilities at the resort include 14 cabins, a clubhouse and lodge, a dance hall and store, a headquarters building and owner's residence, outside restrooms, a boathouse, 6 outside kitchens, a caretaker's cabin, a workshop, 2 covered picnic areas, outdoor tables, and a swimming beach. A diagram of the area surrounding well 2 is provided in the figure.

The water supply is from two shallow wells. Well 1, located about 20 feet from the swimming beach, serves about 90 percent of the area and is the principal source of water for the resort. This well is 16 feet deep and has a concrete casing and an electric pump. It was checked by the sanitation division of the health department on July 22, 1959, during a routine inspection of the resort. At that time, the location and construction of the well were judged satisfactory. The water, however, was listed as not conforming to drinking water standards, since it had consistently tested positive for coliform organisms in the past.

Well 2, located approximately 200 yards uphill and southwest of well 1, serves an outdoor kitchen, a covered picnic area, and a clubhouse with overnight lodge-type accommodations. This well is 24 feet deep and is enclosed in a concrete casing. It has a piston-type pump with a pressure tank. The well covering is made of loose boards which allow easy contamination of the water by surface drainage. At

Plan of King County, Wash., resort area at which an outbreak of gastroenteritis occurred in July 1959



(1) OWNER'S RESIDENCE AND HALL; (2) STORE AND DANCE HALL; (3) CARETAKER'S CABIN; (4) LODGE SERVED BY WELL 2; (5) SHOP. BOLD ARROWS INDICATE DIRECTION OF SURFACE AND SUBSURFACE DRAINAGE.

the time of inspection debris was floating on the surface of the water. Until July 22, this well had never been inspected by the health department; in fact the department was unaware of its existence.

Water samples were taken from both wells on July 28 and 29. Both samples contained coliform organisms, ranging from 5 to 240 MPN.

The resort provides no food except bottled cold drinks, packaged candy, confections, and frozen ice cream bars. The common practice is for groups to bring their own food, which has either been previously prepared at home or is prepared at the resort, using resort facilities. Questioning revealed that very few members of either the company picnic group or the girls' club purchased confections at the resort. Sanitary inspection of the confectionery counter revealed satisfactory storage and refrigeration of the items sold.

The resort has modern restroom facilities with flush toilets. Sewage is disposed of through cesspools. Periodically, the cesspools are pumped by the resort owner and the sludge is buried approximately one-half mile from the resort in a heavily wooded area.

Dye was flushed into several toilets on the second day of the investigation but no dye was recovered in either of the two wells.

Thirty-five of the 36 persons at the girls' club outing were interviewed. Twenty-nine gave a history of illness, beginning from 12 to 48 hours following arrival at the resort and lasting from 6 to 48 hours. Table 1 shows the symptoms suffered.

The resort water supply was, of course, highly

Table 1. Symptoms of illness among 29 persons at a resort in King County, Wash.

Symptom	Persons reporting symptom	
	Number	Percent
Nausea.....	26	90
Vomiting.....	20	69
Abdominal cramps.....	13	45
Fever.....	13	45
Diarrhea.....	10	34
Headache.....	6	21
Dizziness.....	3	10

Table 2. Comparison of incidence of illness with source of water in groups using a popular resort in King County, Wash., July 18-26, 1959

Group code No. ¹	Total persons using water	Source of water (well No.) ²	Persons ill	
			Number	Percent
18-1.....	100	1	0	0
18-2.....	75	1	0	0
18-3.....	80	1	0	0
18-4.....	75	1	0	0
18-5.....	150	2	10	7
19-1.....	400	1	0	0
19-2.....	150	1	0	0
19-3.....	60	2	0	0
19-4.....	40	2	0	0
19-5.....	50	Unknown	0	0
19-6.....	100	Unknown	0	0
19-7.....	50	1	0	0
19-8.....	45	1	0	0
22-1.....	1,000	1, 2	0	0
24-1.....	36	2	29	80
25-1.....	83	2	12	14
25-2.....	125	1	2	2
25-3.....	100	1	0	0
25-4.....	30	1	0	0
26-1.....	150	2	7	5
26-2.....	125	1	0	0
26-3.....	125	1	0	0
26-4.....	40	1	0	0
26-5.....	40	1	0	0
26-6.....	100	1	0	0
26-7.....	80	1	0	0
26-8.....	100	1	0	0
26-9.....	40	1	0	0

¹ First two figures indicate day of month; last figure, number of groups using water source on that day.

² Based on area used for food preparation and serving and on source of water available to that area.

suspect because of well construction, positive coliform counts, and reported bad odor and taste of the water. A comparison between use of water and incidence of illness was made for all groups using the resort during the 9-day period July 18-26. The results are presented in table 2.

Many groups visiting the resort bring their own beverages so that a large percentage probably do not drink resort tapwater, particularly if they are there only a few hours. However, because the girls' club, code No. 24-1, stayed at the resort for several days and because such a high percentage of this group became ill, a rather intensive investigation was made of their food and water consumption and of the swimming activities of the group. Of 22 who swam in the lake, 18, or 82 percent, became ill. Of the 10 who did not swim, 8, or 80 percent, became

ill. Swimming histories were not available on 4 of the 36 girls. Table 3 presents data on the food and water consumption of this group.

Etiological Agent

Bacterial examination of stool specimens from four members of the girls' club who suffered diarrheal symptoms were done by the laboratory division of the Seattle-King County Department of Public Health. The specimens were negative for *Salmonella*, *Shigella*, and pathogenic coliform organisms. The stool specimens were frozen and held for virus isolation. ECHO 9 virus was grown on tissue culture from two specimens. Typing of the virus was done by neutralization tests.

Control Measures

Results of the investigation of the resort area indicated that water, particularly water from well 2, was highly suspect as the vehicle of transmission in the gastrointestinal outbreaks. The following recommendations were made:

- Immediate cessation of use of well 2 as a water source.
- Flushing of all plumbing with hypochlorite solution.

- Adequate chlorination of all water used at the resort area.

- Rebuilding of well 2 to meet State requirements for construction of such a well, or abandonment and sealing of this well.

- Frequent inspection of the premises and sampling of the water by a member of the health department sanitation staff to insure that the above measures are properly carried out and that all water at the resort is safe and potable.

Well 2 was abandoned and sealed. The other recommended measures were carried out, and there have been no further reports of disease associated with this resort.

Discussion

From the standpoint of environmental sanitation practices, this popular resort had been courting trouble for a number of years. Fecal contamination of the main well had been demonstrated repeatedly by positive coliform counts. Poor construction and exposure to surface drainage of the auxiliary well certainly left it highly susceptible to surface pollution. Failure to recover dye from either well, although it does not rule out the role of subsurface pollution in contamination of water supplies, does make such pollution a matter of speculation.

Table 3. Correlation of food and water consumption or activity with gastrointestinal illness among 36 persons following use of facilities at a King County, Wash., resort

Food or activity	Number partaking ²	Number ill	Percent ill	Number not partaking ²	Number ill	Percent ill
Swimming	22	18	82	10	8	80
Water (well 1)	4	2	50	27	24	90
Water (well 2) ¹	30	26	87	5	0	0
Macaroni and cheese	22	18	82	9	8	90
Salad	21	18	85	10	8	90
Milk	22	18	82	9	8	90
Coffee	4	3	75	27	24	89
French toast	30	25	83	2	2	100
Cantaloupe	31	26	84	1	1	100
Coffee	9	4	44	24	20	83
Hot dog	28	23	82	4	3	75
Cocoa	22	19	86	3	3	100
Potato salad	28	24	86	4	3	75
Pork and beans	23	19	83	9	7	78
Fruit salad	25	19	76	7	6	86
Casserole	31	26	84	1	1	100
Buns	25	19	76	6	6	100
Milk	24	20	83	5	5	100
Coffee	6	5	83	25	21	84
Ice cream, concession	0	0	0	28	23	82
Soda pop, concession	12	10	83	18	14	77

¹ Includes soft drink made from water from well 2.

² Includes only those from which a definite history was obtained; unknowns are not included.

The data in table 2 are interesting; note the clustering of illness in groups which followed the large group (22-1) visiting the area on July 22. The resort owner reported overloading of toilet facilities on that date and contamination of the surrounding grounds during the day. From this, one might infer that if pollution of ground water supplies did take place, such pollution might well have occurred during or shortly after this large group had visited the area.

Table 3 shows that almost all the members of the girls' club drank water from well 2. Of those who drank this water, 87 percent became ill. There was also a high percentage of illness in individuals partaking of several other foods and participating in swimming. However, these exposures can be considered coincidental and unrelated when it is demonstrated that a high percentage of illness also occurred in individuals not partaking of these foods or participating in activities. Therefore, it is reasonable to infer from these data that water from well 2 was the vehicle of disease transmission.

Determination of the true etiological agent in these illnesses cannot be made at this time. ECHO 9 (1-3) virus was isolated from two of the four stool specimens submitted. This is a much higher incidence of the ECHO 9 organisms than is usually found in groups of specimens tested for the virus in the laboratory of the Seattle-King County Health Department. According to studies by Ramos-Alvarez and Sabin (4), less than 0.2 percent of healthy persons in this age group should show ECHO 9 virus in their stools. However, lack of further evidence, such as virus in the well water and blood studies for virus antibody titer, and the small size of the sample prevent us from assuming a definite etiological relationship between the ECHO 9 virus and the illnesses.

Particular attention should be directed to the explosive nature of the outbreak. In all

members of the group studied, illness occurred within 48 hours of exposure. Such a sharp incidence certainly points to a common-source type of epidemic and rules out spread by person-to-person contact. The short incubation period might also imply poisoning. However, this can be ruled out by the fact that, in several of the families, well-documented secondary cases occurred following the girls' return home.

Summary

An outbreak of acute gastroenteritis occurred in at least 58 individuals who had visited a resort area near Seattle, Wash., during 1 week in late July 1959. The illness particularly affected two groups who had used certain common facilities at the resort. Epidemiologic study revealed water from a dug well to be the probable vehicle of transmission of the infective organisms. Stool specimens were collected from four members of one group who became ill and were examined for pathogenic organisms. Two of the four specimens contained ECHO 9 virus. No further illness associated with the use of the resort has been reported since chlorination of the water supply was instituted and the suspected well was abandoned as a source of water.

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Testing Death Registration Completeness in a Group of Premature Infants

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THE NORTH CAROLINA State Board of Health for some time has been concerned with the under-registration of deaths, particularly of deaths among the very young. This study, conducted in 1959 with the cooperation of the State board of health, was designed with the following objectives in mind:

- To develop a method of determining the completeness of registration of deaths of infants weighing 1,500 gm. or less at birth.
- Insofar as possible, to use the method developed to measure completeness of registration of deaths for this group of infants.
- To determine, for a selected group of premature infants, the relationship between under-registration of deaths and such factors as birth weight, age at death, race, and marital status of the mother.

At the time of the 1950 census of population, the U.S. Bureau of the Census, the National Office of Vital Statistics, and the North Carolina State Board of Health conducted a test of birth registration completeness (1). This study revealed that birth certificates were on file for 97.6 percent of white infants and for

93.4 percent of nonwhite infants born in North Carolina during the first quarter of 1950.

Although a comprehensive study of the completeness of death registration has never been made in North Carolina, for some time the belief has been that the under-registration of infant deaths is equal to the under-registration of births and greater than the under-registration of deaths of older persons. Furthermore, the mortality rates for premature infants indicate more under-registration of deaths in this mortality-prone group than in other groups of infants. Therefore, this study was limited to infants weighing 1,500 gm. or less at birth. If the method developed proves successful in testing registration completeness in this group, it is reasonable to assume that it could be used successfully among other weight groups.

This retrospective study was anchored to vital records, with the universe defined by registered vital events. An advantage of this method of collecting data is the convenience of using the established vital statistics system, which provides an operating organization for conducting the study. During the planning and conducting of the study every effort was made to minimize the possibility of jeopardizing this operating organization.

North Carolina is fortunate in having a full-time health department in each of its 100 counties. In 78 counties the local health department serves as registrar of vital statistics. In the other 22 counties, town or township appointees serve in this capacity. In this study, the county health departments were the primary source of data. In order to insure the full cooperation of the local health departments, de-

Mr. Rogers is director, bureau of vital statistics, Jefferson County Department of Health, Birmingham, Ala. Mr. Council is chief, public health statistics section, and Mr. Abernathy is biostatistician, North Carolina State Board of Health, Raleigh.

This investigation was made and the report prepared as part of the course "Field Training in Statistics," University of North Carolina School of Public Health. The fieldwork was performed through the North Carolina State Board of Health in the summer of 1959.

tailed plans were discussed with the State health director, the chief of the public health statistics section, and the director of the division of local health. All approved the study design, and public health statistics section personnel assisted the authors in carrying out the study. Other than the services of personnel, the only cost to the State board of health was for postage and supplies.

Collection of Data

A list of infants weighing 1,500 gm. or less at birth, born alive in 1958 to residents of North Carolina, was obtained from the tabulating unit of the State board of health. There were 1,484 such infants registered. Of these, 859, almost 60 percent, were white. Among the white infants, 33 (3.8 percent) were born out of wedlock; of the 625 nonwhite infants, 173 (27.7 percent) were born out of wedlock. This compares with illegitimacy rates of 2.1 and 23.0 percent, respectively, for all white and nonwhite

births in the State in 1958. More than 50 percent of the infants of both races weighed 1,001-1,500 gm. Only a small percentage weighed 500 gm. or less.

The distribution of live-born premature infants weighing 1,500 gm. or less is shown in table 1, by race and percentage born out of wedlock.

A list of infant deaths registered for this group of premature infants was prepared by the tabulating unit from punchcards designed to consolidate data from the birth and death certificates of each infant who died under 1 year of age. When certificates for these infant deaths were matched against certificates for live births, it was found that 1,005 of the 1,484 infants born alive had died and death certificates had been filed for them. The distribution of matched infant deaths and infant death rates, by birth weight and race, is shown in table 2.

For all weight groups, the death rate is higher for white than for nonwhite infants. This could be attributed to a greater force of

Table 1. Resident live births of infants weighing 1,500 gm. or less, by birth weight, race, and percent born out of wedlock, North Carolina, 1958

Birth weight (gm.)	Live births						Percent born out of wedlock		
	Total		White		Nonwhite		Total	White	Nonwhite
	Number	Percent	Number	Percent	Number	Percent			
Total.....	1,484	100.0	859	100.0	625	100.0	13.9	3.8	27.7
500 or less.....	102	6.9	66	7.7	36	5.8	9.8	4.5	19.4
501-1,000.....	523	35.2	308	35.8	215	34.4	12.8	2.6	27.4
1,001-1,500.....	859	57.9	485	56.5	374	59.8	15.0	4.5	28.6

Table 2. Resident live births and matched infant deaths and deaths per 1,000 live births, infants weighing 1,500 gm. or less, by birth weight and race, North Carolina, 1958

Birth weight (gm.)	Live births			Matched infant deaths			Deaths per 1,000 live births		
	Total	White	Non-white	Total	White	Non-white	Total	White	Nonwhite
Total.....	1,484	859	625	1,005	617	388	677.2	718.3	620.8
500 or less.....	102	66	36	87	62	25	852.9	939.4	694.4
501-1,000.....	523	308	215	462	280	182	883.4	909.1	846.5
1,001-1,500.....	859	485	374	456	275	181	530.8	567.0	484.0

mortality or to a higher degree of death registration completeness for whites, or both. Among white infants, the death rate declines as birth weight increases. Among nonwhites, however, the death rate is higher in the 501-1,000 gm. weight group than in the group weighing 500 gm. or less. This seems highly improbable and suggests that under-registration of deaths may be responsible for some of the race differences in death rates shown in table 2, particularly in the group weighing 500 gm. or less.

After the matching process had been completed, there remained 479 unmatched live births of infants weighing 1,500 gm. or less. These unmatched births are shown in table 3, by birth weight, race, and percentage occurring out of wedlock. Since these births were not matched with a death, the infants were assumed to be alive at the time of this investigation.

The unmatched births were approximately equally divided according to race. There are, however, some differences in their distribution by birth weight, according to race. The group weighing 500 gm. or less contains almost three times as many nonwhite as white infants. A preponderance of all births occurring out of wedlock were among nonwhites.

The unmatched births were tabulated according to county of residence of the mother, and a form on which to list the resident births for each county was prepared. Certain identifying information on each child, such as name, sex, race, birth date, legitimacy status, parents' names and address, and name of attendant at birth, was shown. Since all this information was not available from the lists prepared by

the tabulating unit, it was necessary to examine the birth certificates for all 479 unmatched births.

A list of each county's unmatched resident live births of infants weighing 1,500 gm. or less was sent to the director of that county health department, accompanied by a form letter requesting him to ascertain the current status of each infant on his list. If the infant was dead, date of death, county of death, and name of the undertaker were requested. An effort was made to make the letter brief yet clearly understandable as to the information requested. The letter was signed by the State health director.

Eleven counties had no unmatched births for the infants in the study. Only nine infants weighing 1,500 gm. or less had been born in 1958 to residents of these counties. All nine infants had died, and a death certificate was located for each one. In the remaining 89 counties, the number of unmatched resident birth certificates ranged from 1 each in 14 counties to 33 in Cumberland County.

It was considered desirable to develop some method of checking the accuracy of the reports received from the county health departments. The first thought was to query the mother of each infant having an unmatched birth certificate. However, it was finally decided to wait until the responses of the county health departments were received and then to query the mothers of the infants whom the departments reported as alive.

Special consideration was given to planning this phase of the study. In the first place, the

Table 3. Unmatched resident live births of infants weighing 1,500 gm. or less, by birth weight, race, and percent born out of wedlock, North Carolina, 1958

Birth weight (gm.)	Unmatched births ¹						Percent born out of wedlock		
	Total		White		Nonwhite		Total	White	Nonwhite
	Number	Percent	Number	Percent	Number	Percent			
Total.....	479	100.0	242	100.0	237	100.0	15.4	5.0	26.2
500 or less.....	15	3.1	4	1.7	11	4.6	13.3	0	18.2
501-1,000.....	61	12.8	28	11.6	33	13.9	14.8	3.6	24.2
1,001-1,500.....	403	84.1	210	86.7	193	81.5	15.6	5.2	26.9

¹ Births for which no matching death certificate could be found.

counties had already been asked for this information, and should they learn that the mothers of these infants were queried for the same information there could be repercussions which might damage the relationship between the State and county health departments. Second, 74 (15 percent) of the 479 unmatched birth certificates were for infants born out of wedlock, and it is the policy of the State board of health to give mothers of these infants as little publicity as possible.

A brief questionnaire, designed to obtain from the mothers essentially the same information as that requested from the county health departments, was prepared. Most of the information requested could be provided by checkmarks. Two leading questions were used to indicate a sincere interest in the premature infant. However, the primary interest of the study was in whether the infant was living or dead.

The data from this questionnaire were intended to serve two purposes: (a) to measure the reliability of the information supplied by the county health departments and (b) to determine the feasibility of querying the mothers as an alternate means of obtaining information retrospectively concerning the current status of a selected group of premature infants.

Findings

The response to the queries was gratifying. Reports were received from one-third of the counties during the first week following the date of mailing the questionnaire, and within 10 days reports had been received from 74 percent of the counties receiving the questionnaire. The overall response was 100 percent. Reports had been received from all but six counties within 3 weeks. Followup letters were sent to these counties, and reports from four were received shortly thereafter. It was necessary to call two counties by phone.

Reports were received on all 479 infants, on 300 (63 percent) during the first 10 days after mailing the questionnaires. The counties with relatively few study infants were the most prompt in reporting.

A tabulation of the reports from the counties indicated that 81 infants were dead. These

reports were rechecked against the death files in the State board of health, and 20 death certificates not identified in the initial matching were found. The remaining 61 deaths were considered to be unregistered.

When the mothers were queried, it was found that eight of the infants reported as alive by the counties were actually dead. Thus, the total number of unregistered deaths for this group of infants was found to be 69, or 14.4 percent of the unmatched births.

Reliability of County Data

As previously stated, to check the accuracy of the data obtained from the counties, a questionnaire designed to elicit essentially the same information as the questionnaire sent to the county health departments was mailed to the mothers of 332 infants whom the county health departments had not reported as dead. Two followup queries were sent to mothers who did not respond to the original questionnaire. A response rate of approximately 80 percent was finally obtained. Questionnaires were not sent to mothers of those infants whom the counties had reported as dead, since in most cases the county health department had contacted these mothers when securing death certificates for the infants. The mothers of illegitimate infants also were not queried.

As a result of querying the mothers, eight additional unregistered deaths were found. In view of the more accurate information thus obtained and the mothers' fairly high response rate, querying the mothers might be more productive than sending questionnaires to county health departments. Certainly, it would be cheaper and would lend itself to a larger population of infants.

Death Registration Completeness

In order to measure death registration completeness, it is necessary to know the actual number of deaths and the number of registered deaths in a community. In North Carolina, the number of registered deaths was known. An estimate of the actual number of deaths, hereafter referred to as actual deaths, of infants weighing 1,500 gm. or less at birth was obtained by combining the registered and unregistered deaths found in the study. Death registration

completeness may be defined as the ratio of registered to actual deaths. The death registration completeness for this selected group of premature infants is shown in table 4, by birth weight and race.

The completeness of death registration in this group was 93.7 percent, ranging from 73.5 percent for nonwhite infants weighing 500 gm. or less to 96.6 percent for white infants weighing 501-1,000 gm. The completeness of death registration for nonwhite premature infants weighing 1,500 gm. or less (89.9 percent) was less than the completeness of birth registration (93.4 percent) for all nonwhite infants in North Carolina in 1950 (1). The completeness of death registration for white infants in the study group (96.3 percent) was also less than the completeness of birth registration (97.6 percent) for all white infants in 1950 (1). For all weights, the registration of deaths was more complete for white than for nonwhite infants.

The percentages shown in table 4 represent the upper limit of registration completeness. They cannot be increased but should more unregistered deaths be found among the study infants, the registration completeness percentages would be decreased.

Effect of Study Findings on Death Rates

Another method of examining the under-registration factor in death registration is by comparing observed and actual death rates. "Observed rates" are defined as registered deaths per 1,000 live births; "actual rates," as the total of registered and unregistered deaths per 1,000 live births. The observed and actual death rates for the infants in the study are shown in table 5, by race and birth weight.

As a result of this study, the death rate for all premature infants weighing 1,500 gm. or less at birth was increased from 690.7 to 737.2 deaths per 1,000 live births. The greatest in-

Table 4. Death registration completeness for a selected group of premature infants, by birth weight and race, North Carolina, 1958

Birth weight (gm.)	Deaths									Percent complete- ness of registration		
	Actual			Unregistered			Registered ¹					
	Total	White	Non- white	Total	White	Non- white	Total	White	Non- white	Total	White	Non- white
Total -----	1, 094	649	445	69	24	45	1, 025	625	400	93. 7	96. 3	89. 9
500 or less -----	100	66	34	13	4	9	87	62	25	87. 0	93. 9	73. 5
501-1,000 -----	498	296	202	26	10	16	472	286	186	94. 8	96. 6	92. 1
1,001-1,500 -----	496	287	209	30	10	20	466	277	189	94. 0	96. 5	90. 4

¹ Includes 1,005 matched infant deaths and 20 mismatched deaths.

Table 5. Observed and actual death rates for a selected group of premature infants born alive, by race and birth weight, North Carolina, 1958

Birth weight (gm.)	Observed death rates ¹			Actual death rates ²			Increase due to findings		
	Total	White	Nonwhite	Total	White	Nonwhite	Total	White	Nonwhite
Total.....	690.7	727.6	640.0	737.2	755.5	712.0	46.5	27.9	72.0
500 or less.....	852.9	939.4	694.4	980.4	1,000.0	944.4	127.5	60.6	250.0
501-1,000.....	902.5	928.6	865.1	952.2	961.0	939.5	49.7	32.4	74.4
1,001-1,500.....	542.5	571.1	505.3	577.4	591.8	558.8	34.9	20.7	53.5

¹ Registered deaths per 1,000 live births.

² Registered and unregistered deaths per 1,000 live births.

creases in death rates as a result of the inclusion of unregistered deaths in the rate computations were among the nonwhite infants in all birth weight groups. Both the observed and actual death rates are highest among white infants in all weight groups. The current status of 30 infants was not indicated since the counties were unable to locate them. Therefore, the actual rates shown in table 5 are probably understated since it is very likely that some of these 30 infants died shortly after birth.

Factors in Under-Registration

The findings of this study indicate a close relationship between certain factors and under-registration of deaths among a selected group of premature infants. A comparison of these factors in registered and unregistered deaths follows. The 69 unregistered deaths of infants weighing 1,500 gm. or less at birth are shown in table 6 by birth weight and age at death, race, place of delivery, and attendant at birth.

Birth Weight

Fifteen infants in the study group weighed 500 gm. or less at birth (table 3). None of the infants in this weight group were reported as living. Reports from the counties revealed the deaths of 12 which were found to be unregistered; 1 was found to have been a fetal death rather than a live birth; and 2 could not be located. Of the latter two, one mother re-

ported the death of her infant. Thus, the deaths of 13 (86.7 percent) were found to be unregistered.

The 501-1,000 gm. weight group contained 61 study infants. County reports revealed 23 unregistered deaths, 11 deaths which had previously been registered but were not identifiable from the matched infant death cards, 1 fetal death previously reported as a live birth, and 1 for whom the birth weight had been incorrectly stated on the certificate. Four could not be located by the counties, and 21 of the infants were reported as living. Replies to the queries submitted to the mothers revealed three additional unregistered deaths. The total number of unregistered deaths found then for this weight group was 26 (42.6 percent).

In the 1,001-1,500 gm. weight group, 403 infants were listed on the questionnaires mailed to the counties. The deaths of 26 were found to be unregistered, deaths of 9 were registered but had not originally been identified, 2 were reported as fetal deaths, 24 could not be located by the counties, and 342 (84.9 percent) were reported to be living. The mothers reported 4 of these as dead, bringing to 30 (7.4 percent) the total number of unregistered deaths for this weight group.

Age at Death

Fifty-seven (82.6 percent) of the infants whose deaths were unregistered died in the

Table 6. Distribution of 69 premature infants whose deaths were unregistered, by birth weight, age at death, race, place of delivery, and attendant at birth, North Carolina, 1958

Birth weight and age at death	Race		Place of delivery		Attendant at birth	
	White	Nonwhite	Hospital	Home	Physician	Midwife
Total.....	24	45	55	14	60	9
500 gm. or less.....	4	9	11	2	12	1
Under 1 day.....	2	6	7	1	8	-----
1-27 days.....	1	1	1	1	1	1
28 days and over (and unknown).....	1	2	3	-----	3	-----
501-1,000 gm.....	10	16	18	8	22	4
Under 1 day.....	8	13	14	7	18	3
1-27 days.....	2	1	2	1	2	1
28 days and over (and unknown).....	-----	2	2	-----	2	-----
1,001-1,500 gm.....	10	20	26	4	26	4
Under 1 day.....	7	9	15	1	15	1
1-27 days.....	3	4	5	2	5	2
28 days and over (and unknown).....	-----	7	6	1	6	1

neonatal period (under 28 days), four deaths occurred after the neonatal period, and the age at death of eight of the infants was unknown. Of the 57 neonatal deaths, 45 (78.9 percent) occurred under 1 day of age. Differences in age at death between registered and unregistered deaths were found to be highly significant at the 1 percent level.

Race

Forty-five (65.2 percent) of the 69 infants whose deaths were unregistered were nonwhite. Of the infants whose deaths were registered, 39.0 percent were nonwhite. The proportion of unregistered deaths among nonwhite infants was significantly higher than expected. A chi-square test indicated significance at the 0.1 percent level.

Place of Delivery and Attendant

Of the infants whose deaths were registered, 8.3 percent were delivered in the home and 3.3 percent were attended by a midwife. For the unregistered deaths, 20.3 percent of the infants were delivered in the home and 13.0 percent were attended by a midwife. Differences in these proportions were found to be highly significant at the 1.0 percent level. The eight unregistered deaths reported by the mothers were all infants delivered in a hospital by a physician.

Undertaker

Burial or disposal of the infant's body was handled by a funeral director in 44 of the unregistered deaths, by the family in 16, and by the hospital in 2. In seven cases the undertaker was unknown. The fact that 64 percent of the infants whose deaths were unregistered were buried by a funeral director and 23 percent were buried by the family is important in planning action to improve the registration of deaths of premature infants. Some funeral directors are evidently lax in registering deaths of premature infants and need closer supervision. Also, possibly more registration promotional efforts should be directed toward the family.

Births Out of Wedlock

Differences in proportions of registered and unregistered deaths of infants born out of wed-

lock were suggestive but not significant at the 5 percent level. Among the unregistered deaths, 18.9 percent of the infants were born to unmarried mothers; among the registered deaths, 10.9 percent.

Table 7 shows the distribution of unregistered deaths by birth weight of infant, undertaker, and number of infants born out of wedlock.

Geographic Distribution

The 69 unregistered deaths were distributed among 37 counties in all sections of the State. The highest number for any county was 13. One county reported six deaths, one reported four, three counties reported three each, six reported two each, and 25 counties reported one each.

Other Findings

In addition to the 69 unregistered deaths, the counties reported 20 other infant deaths. A further search of the files in the State board of health revealed a death certificate for each of these deaths. These certificates had not been identified with the birth certificates in the initial matching process for various reasons, usually differences in the names. For four infants, both a live birth and a fetal death certificate were on file. These irregularities were called to the attention of the public health statistics section and the funeral directors and corrections were made.

Summary and Conclusions

A study of the registration of deaths of a selected group of premature infants was con-

Table 7. Distribution of 69 unregistered premature infant deaths, by birth weight of infant, undertaker, and number of infants born out of wedlock, North Carolina, 1958

Birth weight (gm.)	Undertaker			Number born out of wedlock
	Funeral director	Family	Other and un- known	
Total.....	44	16	9	13
500 or less.....	5	4	4	2
501-1,000.....	13	10	3	5
1,001-1,500.....	26	2	2	6

ducted in 1959 in North Carolina in an attempt to develop a method of determining the completeness of death registration for this group of premature infants, weighing 1,500 gm. or less at birth; to measure the completeness of death registration for these infants by using the method developed; and to determine the relationship of factors such as race, birth weight, age at death, and illegitimacy to under-registration of deaths in this group.

Two methods were developed: (a) querying county health departments 6 to 18 months after birth in regard to the current status of each premature infant who had not been reported dead and (b) querying the mothers of these infants.

The results indicate that the first method is practicable and relatively inexpensive. A high degree of response was obtained from the counties, reaching 100 percent after followup.

Querying the mothers of infants did not yield the same high response. On the other hand, this approach revealed eight deaths that the counties had overlooked. However, it remains to be determined just how the mothers of dead infants would respond to requests for information, since the mothers of the infants reported as dead by the counties were not queried in this study. Querying the mothers would lend itself to a larger population and should be much cheaper than working through the local health departments.

By using the data from this study, death registration in this group of premature infants was found to be 93.7 percent complete. The completeness of death registration for both white and nonwhite infants in this selected weight group was lower than the completeness of birth registration in 1950 for infants in all weight groups.

A number of factors were found to be closely related to under-registration of deaths in this selected group of premature infants. Among the most important were birth weight, age at death, race, attendant at birth, and place of delivery.

Other findings of the study point up the need for improvement in the State health department's matching of birth and death certificates of infants as well as the need for education of funeral directors and parents in their responsibility for registering infant deaths.

Although this study was made on the death registration of premature infants who weighed 1,500 gm. or less at birth, one should be able to use this method to study registration of deaths for any group of infants.

REFERENCE

- (1) U.S. National Office of Vital Statistics: Vital statistics of the United States, 1950. Washington, D.C., U.S. Government Printing Office, 1954, vol. 1, pp. 108-117.

CDC Training Bulletin

Training courses to be offered by the Public Health Service's Communicable Disease Center during fiscal year 1962 are described in the "CDC Training Bulletin, July 1, 1961, to June 30, 1962." Titles, numbers, and dates for the courses were listed in the July issue of *Public Health Reports*, p. 640.

The new bulletin also describes other CDC training services and provides general information of interest to the prospective student. Audiovisual aids available from the CDC Film Library are listed for each category of courses.

Copies of the bulletin are available from the Chief, Communicable Disease Center, Atlanta 22, Ga., or the appropriate regional office of the Department of Health, Education, and Welfare.

Hospital Code for Press Relations

The following code for guiding press relations, prepared for the Fairfax Hospital, Fairfax, Va., and adopted with minor modifications, was published in the News Letter of the National Association of Science Writers, as submitted by Nate Haseltine, science editor for the Washington Post.

We will cooperate with the press to the fullest extent, without, of course, sacrificing our right and duty to our physicians and their patients to protect the doctor-patient relationship. We will not, however, use this relationship as an improper excuse to dismiss legitimate press inquiries. We will do whatever we can to expedite replies and to encourage cooperation by the physician, the patient and his family, and other authorities in this respect.

Wherever feasible, information about the hospital and its activities, including patient care, will be expeditiously routed through the hospital's press relations office. However, when this places an undue hardship on inquiring newsmen (who face constant deadlines), the persons next in press relations authority (administrator, assistant administrator, nursing supervisor on duty, or person in charge of the emergency room) shall be authorized to expedite permissible information to the press.

The most common complaint of the press against hospitals revolves around the emergency room, which works around the clock with changing personnel. Many of those in charge of emergency rooms do not know what information they should or should not give to newsmen.

For police cases the following items of public information may and should be given with or without the patient's consent:

1. Name: (a) Married or single, (b) color, (c) sex, (d) age, (e) occupation, (f) firm or company employing patient, and (g) address.

2. Nature of Accident: (a) injured by automobile, explosion, shooting, etc., (b) fractures may be ascribed to the member involved, that is arm, leg, and newsmen may be told if it is simple or compound.

3. Injuries of the Head: Such injuries are best described as head injuries, without guess elaborations such as possible skull fracture. No opinion should be given as to severity until that severity is definitely determined, and prognoses are not made in the emergency room.

4. Internal Injuries: Internal injury or suspect internal injury may be stated, and a statement that the condition is very serious may be made. More specific location of the injuries should not be made.

5. Unconsciousness: Newsmen may be told if the patient was unconscious when brought to the hospital, and such statements as "the patient was still unconscious (number of) hours after he was brought here." The cause of unconsciousness, unless certain, may be withheld.

6. Poisoning Cases: Reports of such cases should be made expeditiously to the police, and inquiring reporters referred to the police for information.

7. Shooting: Newsmen may be told that a penetrating wound of a specific body site is involved. Statements on the circumstances of the injury or injuries are the province of the investigating police. The degree of injury, that is the condition of the patient, may be divulged, but no prognosis should be given.

8. Stabbing: Same as for shooting.

9. Intoxication: No statement on a patient's intoxication or degree of intoxication should be made; this, too, is a police matter.

10. Burns: A statement may be made that the person is burned, and burned body portions and degree of burn may be specified. The nature of the accident, when absolute facts are known, may be given to newsmen.

11. The name of the attending physician, when requested, may be given to newsmen so they may seek additional information (not releasable by hospital authorities) from him without using his name unless he permits it.

12. Pictures: Newspapers requesting permission to take photographs of patients shall be referred to the hospital administrator or his des-

ignated authority. Pictures taken of patients in the emergency room or awaiting emergency care may be taken with the administrator's permission, but no pictures identifying a patient may be published without the patient's consent. In police cases, the rule on patient's consent may be relaxed if the patient is duly charged with a crime against the public (such as an injured gunman captured during or after a holdup).

Any conflict of ideas as to the extent of information which can be or should be given should be quickly resolved by the administrator or his designated next in authority.

For other than police cases, the following rule will prevail.

If the patient is conscious and can communicate with the physician or nurse in charge, or

relatives, he should be asked if he will permit any information to be given, and his decision will be final. He should not be prompted into a negative attitude by such assertions as "You don't want us to tell this to nosey reporters, do you?" More cooperatively, the question might be put something like: "Newspaper reporters are interested in your case. May we have your permission to tell them—?" When a patient is a minor, his nearest relative may speak for him, preferably directly to the press or, permissibly, through a responsible hospital authority (physician, nurse, press relations officer).

If we follow these rules sensibly we will maintain good press relations without violating the rights and privileges of our charges.

Hearing Aids, Wheel Chairs, Braces, and Limbs

About 1,161,000 of the civilian, noninstitutional population of the United States have hearing aids, according to a report by the Public Health Service's National Health Survey on "Distribution and Use of Hearing Aids, Wheel Chairs, Braces, and Artificial Limbs, United States, July 1958-June 1959." This total represents one-fifth of the people who are reported to have hearing impairments.

Among the persons with hearing impairments, proportionately more females than males have hearing aids. The proportion with hearing aids is also consistently higher in urban than in rural areas.

About 253,000 people have wheel chairs, the survey shows. Some 54 percent of these are persons so disabled as to be confined to the house except in emergencies.

Estimates of 201,000 persons with leg or foot braces and 494,000 with other types of braces were reported by the survey. About

82,000, or 41 percent, of the leg or foot braces are for children under 15 years of age, and about three-fourths of these 82,000 braces are worn because of conditions due to poliomyelitis or of congenital origin.

Of the estimated 139,000 persons with artificial limbs, 132,000, or 94 percent, are males. About 106,000, or 76 percent of the total number, are persons with an artificial leg or foot. Persons with an artificial limb represent about one-half of the 274,000 who reported the absence of either arms or legs.

The estimates are derived from household interviews with a representative sample of the population conducted for the National Health Survey by the U.S. Bureau of the Census. The report, PHS Publication No. 584-B27, may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for 25 cents.

Public Health and Medical Aspects of the Roseburg, Oreg., Disaster

JOHN H. DONNELLY, M.D., MAX BRADEN, M.P.H., and JOSEPH L. TAYLOR, M.P.H.

A DISASTROUS explosion shook downtown Roseburg, Oreg., early on August 7, 1959. A truckload of high explosives, parked adjacent to a building supply firm, was detonated by a fire in the company building. It was a disaster which could occur in any community but which most people tend to think only happens somewhere else. Because it was completely unexpected and so sudden in onset, the responses to the effects of the explosion were those which would normally operate to meet any emergency.

This report deals with the consequences of the event to public health and the medical emergency. Since many of these problems are common to those which may be expected in a civil or wartime disaster in any town, a recounting of the experiences immediately following the explosion may be valuable for civil defense and public health disaster planning in other communities.

Roseburg, a town of 13,000, is the county seat of Douglas County, located in the southwestern part of Oregon. The economy of the area is primarily dependent on the lumber industry, with agriculture and related enterprises providing the balance. Extensive forests within the county provide an abundant supply of raw material for the industry.

The Douglas County Health Department, which coordinated the public health activities subsequent to the explosion, is located in the courthouse building at Roseburg. It is staffed

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by a full-time health officer, two full-time sanitarians, five full-time public health nurses, and a clerical and secretarial staff of three. There had been no formal review or planning for disaster preparedness within the health department staff since the health officer had assumed his duties in the department about 5 weeks previously.

At 8:30 p.m. on August 6, a truck loaded with $2\frac{1}{2}$ tons of 40 percent dynamite and 4 tons of nitrocarbonitrate entered the city. The driver allegedly had received permission to park the truck on a parking strip adjacent to a building supply business three blocks from city center.

At 1:00 a.m., a young man and his wife passed by and noticed a fire within the building supply firm. The man stayed to observe the fire while his wife summoned the fire department. The contents of the explosive-laden truck were not realized by those present until 1 minute before the explosion at 1:15 a.m. About 20 people, mostly police, firemen, and nearby residents, were within a block of the fire prior to the explosion.

It has been estimated that the explosion was equivalent to 26 kilotons of TNT bombs. A crater 50 feet wide and 12 to 14 feet deep remained.

The immediate blast area and the fire-damaged area included about eight square blocks. Structural damage to buildings extended over a 25-block area (1,800 feet from ground zero). Lesser damage, such as broken windows, occurred over a much larger area, 50 to 75 square blocks (see chart).

Estimates of property damage amounted to more than \$12 million excluding losses in wages, business income, reparative services, medical fees, and such items. Thirteen deaths occurred

and 57 persons received treatment for injuries. It is believed that deaths and injuries would have been much greater had the explosion occurred 3 to 5 minutes later. Volunteer fire fighters, auxiliary police, and curious individuals already alerted would have arrived on the scene in that interval.

Fire fighters and other officials believe that a second and possibly more violent explosion was averted when 150,000 gallons of liquid propane gas stored 400 feet from ground zero was saved. Not one of the four large tanks was damaged. Streams of water were played constantly on the tanks during the fire to keep them cool.

The Roseburg National Guard unit was ordered by its commanding officer to assemble immediately after the explosion, and the entire downtown area was evacuated and barricaded. A pass system was in operation by 6:00 a.m., August 7, and unauthorized persons were prevented from entering the area. Two other National Guard units ultimately arrived to assist in maintaining maximum security.

The director of the Oregon State Civil Defense Agency was notified of the disaster about 2:00 a.m., and he in turn alerted the State health officer and other State officials in accordance with the Oregon State civil defense plan. The State health officer was unable to reach the Douglas County health officer, so he telephoned the Lane County health officer at Eugene, 75 miles north of Roseburg. The Lane County health officer was requested to proceed to Roseburg to give all possible aid and offer the assistance of the staff of the Oregon State Board of Health.

The Lane County health officer upon departing alerted the Sacred Heart Hospital in Eugene to stand by to receive emergency patients from Roseburg. He and one Lane County sanitarian arrived in Roseburg at 6:15 a.m. They immediately contacted Douglas Community and Mercy Hospitals in Roseburg and learned that the Sacred Heart Hospital would not be needed. Subsequently this information was relayed to Eugene via State police radio.

Health Aspects

Generally, health hazards resulting from this disaster were related to contamination, adulteration, and glass impregnation of foods, drugs,

furniture, and bedding; identification and disposition of the dead; provision of first aid and emergency treatment of the injured; supplying food and shelter to the dispossessed; and the mobilization of medical, nursing, sanitation, and building inspection personnel.

Nearly every window in Roseburg's business district was broken. Glass fragments, driven with tremendous force, penetrated food, drugs, furniture, and all types of soft and perishable goods. In the heavily damaged areas, electricity was not restored for about 7 days and gas service 10 to 12 days later. Service was reestablished earlier in areas of less damage. It was necessary to make thorough inspections before these services could be restored with complete safety.

Water Supply and Sewerage

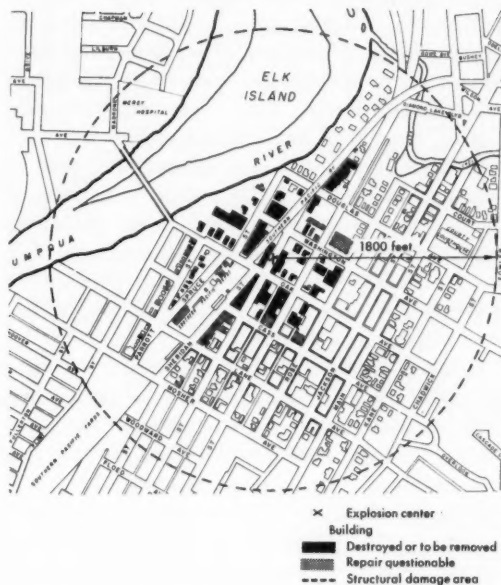
At 1:20 a.m., just after the explosion, a health department sanitarian, working as a volunteer fireman, called the water filter plant and requested that extra pumps be turned on to maintain the pressure in Roseburg mains. The other sanitarian phoned at 1:30 a.m. to inquire about the adequacy of water pressure and to request that the chlorine dosage be increased at the filter plant.

A survey of water and sewerage facilities made the morning of the disaster by the Douglas County Health Department showed neither had sustained damage. Water pressure in the mains did not drop below 80 pounds per square inch. There were no apparent breaks in the sewerage system. A news release affirming the safety of the water was provided to local television, radio, and newspapers by the county health department.

Food and Drugs

Responsibility for enforcement of laws and regulations pertaining to the processing, storing, and selling of foods and drugs in Oregon is vested in many agencies. The county health department is responsible for enforcing those laws pertaining to restaurants; the State department of agriculture has authority over milk producers and processors, grocery stores, and bakeries; the State liquor control commission has responsibility in establishments serving alcoholic beverages; and the Oregon Board of

Extent of damage in Roseburg



Pharmacy supervises some laws relating to the sale of drugs. After the explosion the Food and Drug Administration worked through local and State agencies in assuring that commodities within their jurisdiction were within safe limits before allowing them to reach consumers.

At 7:45 a.m. on August 7, the Douglas County Health Department staff and the Lane County health officer and sanitarian held a briefing to make plans for the day. It was decided first to survey restaurants and grocery stores in the affected area. No attempt was made in this survey to complete detailed inspections, the main purpose being to warn operators of these establishments to exercise caution to assure that spoiled, contaminated, or adulterated foods were not served or offered for sale.

Operators also were informed of their liability and the possibility of litigation if damaged or contaminated food was used or sold. Excellent cooperation was received in withholding these foods from consumers. The county health department issued a news release stating that establishments having foods or medicines to be destroyed should contact the department staff so that they might supervise disposition of these items to minimize scavenging. Another release

warned all citizens to observe caution in the use of food damaged in the home. Citizens were urged to discard any foods that could possibly contain shattered glass, perishables kept at room temperatures for more than 4 to 6 hours, and cans with dents or bulges.

Sanitarians continued inspection of restaurants and grocery stores on August 8 and 9. Bakeries, candy counters, and food storage plants were added to the inspection list to assure that no injurious foodstuffs were being offered for sale.

Many establishments with inoperative refrigeration were advised to move perishable foods to unaffected cold storage immediately. Frozen foods that had thawed were destroyed under supervision of the health department. Establishments that sustained damage precluding their operating in a sanitary manner were ordered to close until necessary corrections could be made and approved.

In order to protect and maintain the public health and safety the county health officer applied a liberal interpretation to public health laws and their enforcement. He received excellent cooperation, and his authority and actions were not challenged.

On August 10 it was determined that local health department personnel could not complete all the necessary and detailed inspections within a reasonable period. A request for assistance was submitted to the State health officer who dispatched three sanitarians to the Douglas County Health Department for as long as they were needed.

The State department of agriculture and the Federal Food and Drug Administration were also asked to assign personnel. Three men were made available to Douglas County from these agencies. The Lane County Health Department also assigned one sanitarian.

A total of nine sanitarians, working in teams of two or three, made detailed inspections of 40 restaurants, 13 wholesale and retail grocery outlets, 3 bakeries, 5 drug stores, and several establishments which carry other perishable foods. Multiple inspections were required of each establishment before being allowed to reopen. Businesses that were completely destroyed or severely damaged and out of business were not inspected. All operators were re-

quired to meet minimum sanitary standards and to obtain and post a certificate authorizing them to reopen for business. Food service establishments that could not meet dishwashing standards were allowed to use paper plates.

Furniture and Bedding

The Oregon State Board of Health licenses furniture and bedding manufacturers and dealers. The law and regulations apply to upholstered furniture and all types of bedding which have a concealed filling, such as sleeping bags and pillows. They do not pertain to such items as clothing, carpeting, and shoes.

One Oregon State Board of Health sanitarian and an assistant inspected 20 retail furniture and bedding outlets. A total of 478 items from 12 stores were condemned and ordered destroyed. The salvage of wood frames and spring assemblies was allowed. All articles were condemned because they were impregnated with glass fragments. The condemned merchandise was ultimately collected and destroyed under supervision of the county health department.

An example of the difficulty in salvaging soft goods impregnated by glass was demonstrated in a shoe store. The plate glass windows in the front of the store had been shattered and the carpet covering the floors was heavily impregnated with shards. The operator had repeatedly thoroughly vacuumed the carpet until no more glass was in evidence. As an added precaution, he laid loose strips of new carpeting in front of the fitting chairs. On the first day he opened for business after the explosion, a woman in her bare feet stepped off the strip onto the original carpeting. A glass fragment cut her foot. Subsequently the strips were lifted and tiny glass shards were visible on the subcarpet.

A number of glass-impregnated sleeping bags were taken to the city dump for disposal by the county sanitarians. A group of scavengers at the dump became incensed when they saw the bags were being burned. Tempers flared up concurrently with the merchandise. It was inconceivable, they thought, that apparently good sleeping bags would be so destroyed.

A meeting was arranged between the Douglas County health officer, the Oregon State Board

of Health sanitarians, and representatives from insurance companies to discuss the law and to assure that claims for loss suffered by merchants would be recognized by insurance companies when orders for destruction of goods were issued by the public health authorities.

The insurance representatives agreed with the reasons for action and expressed appreciation and concern for the public health needs that were being met. They were informed that they could request reinspection of any article they felt had been unjustly condemned. Two forms were developed to facilitate the final disposition of goods.

A large quantity of clothing, shoes, and other such goods was inventoried and allowed to be shipped to salvage companies by various merchants through agreement between the individual businesses, their insurance adjusters, and public health authorities. Copies of the inventories were furnished the State board of health for followup with the respective salvage companies.

Building Inspection

Building inspection is the responsibility of the Roseburg Public Works Department, and one building inspector performs this service.

Five hours after the explosion the city manager temporarily prohibited entry to all buildings in the disaster area until adequate safety inspections had been made. The legality for this action was not questioned. Building owners, tenants, and the general public cooperated 100 percent in this police action.

On the day of the explosion and the following day 16 persons qualified to do building or related inspections voluntarily offered their assistance.

On August 8 the disaster region was divided into small areas and building inspection teams were assigned. As more inspectors arrived, the areas were made smaller and additional teams assigned. On August 10, 26 more inspectors reported to the city as a result of a request submitted to the governor.

The first objective was to make an original inspection and determine what repairs, if any, were needed before owners, tenants, or employees would be permitted to enter the buildings. A form for a temporary structural inspection was prepared and posted in the

building subsequent to each inspection. If needed repairs were minor, the owner was allowed to enter and correct those items needing immediate attention. For major corrections, the owner's qualified contractor was asked to get a permit to enter. Proper safety equipment was required to work in buildings, and hard hats were required for everyone entering the disaster area. These were obtained and made available to those who needed them.

At the time of the first inspection a letter was given to owners, operators, and tenants explaining the purpose of the inspection and the procedure for obtaining a certificate to allow public occupancy of the building. A second form, "Report of Emergency Building Inspection After Blast and Fire," was completed during the first inspection and filed at city hall. The third form, "Public Occupancy Inspection Report," was sought after by business establishments because this permitted them to open for business when the area was opened to the public. In some instances only a portion of the building was approved, and this was so indicated on the form.

A total of 960 inspections were conducted, with 285 business buildings and 195 residences inspected an average of two times each.

On August 15 the downtown area was opened to public passage. Only foot traffic was allowed because some premises were not ready for occupancy, and damaged sidewalks forced people to walk in the street in many areas. Rope barriers were used to guide traffic.

During the entire disaster period every effort was made to coordinate the work of various agencies and organizations. A meeting, facetiously referred to as "the high command meeting," was scheduled each day at 4:00 p.m. Representatives of all departments and agencies attended to report progress and discuss problems, and through the meetings became familiar with the functions of other departments, a process which facilitated the proper referral of inquiries. Everyone concerned agreed the daily meetings were instrumental in reopening the business district in a relatively short time.

Miscellaneous Problems

Two flour and feed mills in the area were completely devastated by blast and fire. Large

quantities of soaked grain and grain products became a breeding place for flies. These locations were sprayed heavily with a residual insecticide.

The possibility of these areas becoming infested with rats was also considered. When rats appeared a month later, the services of a private exterminator were obtained through the cooperative efforts of the county health department and the city of Roseburg.

Large quantities of glass and other debris were disposed in an unused sewage treatment plant. The health department requested that this area be fenced as a safety precaution, and the city complied with this request.

Medical Emergency

The Roseburg disaster claimed 13 lives; 12 deaths were instantaneous or within about a week and 1 occurred later as a result of injuries. One person sustained severe permanent brain damage. Fifty-seven persons were treated for injuries at the three hospitals, and an undetermined number received first aid at Red Cross emergency clinics. Mercy Hospital sustained minor damage from the blast, and a few of the injured were hospital patients or staff. While the facilities of the veterans hospital were available to the community during the disaster, only three injured persons were treated there. Douglas Community Hospital, like Mercy, a general community hospital, became the main medical facility for the disaster victims.

Thirty-nine patients were treated at Community, starting at 1:45 a.m. Sixteen of these had been admitted by 4 a.m. The others were treated and immediately released. At about 2:15 a.m., the triage system was instituted. Only 30 percent of the beds were occupied, and at 1:50 a.m. these patients were moved into one section, so that all treatment facilities could be utilized for the emergency.

At Mercy Hospital, 15 patients were treated for minor injuries, beginning at about 1:20 a.m. Five of these persons were admitted. No other injured were admitted because of the damage to the hospital. Twenty of Roseburg's 31 physicians reported to Community, and worked approximately 120 man-hours giving the immediate treatment required by the injured. The

first physician reported at 1:50 a.m., the last at 2:30 a.m.

Nine of those treated at Douglas Community Hospital required emergency lifesaving measures. Lacerations and bruises were the most common type of injury; however, there were several fractures and one person suffered severe burns. Five persons were treated for punctured eardrums.

Around 2 a.m., the Red Cross set up emergency first-aid stations at the armory and the fairgrounds, but few of the injured were treated at these facilities. Two or three physicians and dentists and seven or eight nurses from the veterans hospital worked at the armory.

Food and shelter facilities were also offered at the armory. Food service was expanded to feed disaster workers and remained in operation through most of the following week.

The Douglas County health officer visited these first-aid stations within a few hours after they were set up to assure that they were adequately staffed. At the armory he examined 8 or 10 persons who had sustained minor lacerations, primarily from flying glass. A combination portable generator and floodlight operated by the National Guard provided illumination in the armory because electric service was not functioning after the disaster.

More than 50 persons responded to a call for blood, and 27 pints were drawn before immediate needs were met. The names and addresses of all donors were recorded, and they were asked to remain on call. Several pints of blood were obtained from the local blood bank and additional blood was flown from Grants Pass, Ore., but it was not needed.

One public health nurse assumed duty as Red Cross and civil defense coordinator for nurses. She was successful in recruiting sufficient nurses to cover all shifts in the hospitals and emergency clinics. Many nurses reported during the early hours of the disaster. When enough nurses were on duty to staff the clinics and hospitals adequately, others were asked to report on later shifts.

After all the injured were treated, it was discovered that some records did not include adequate addresses because dwelling units had been destroyed. The local health department staff attempted to follow up all who had received

treatment, but they were unable to reach everyone. A request for treated persons to report was made through the press and radio. Of the 57 injured, 34 were located and records were completed. A number of the injured were out-of-town guests in the local hotels who left Roseburg shortly after receiving treatment.

Between 2 and 6 a.m., August 7, the Douglas County health officer visited each of the hospitals and first-aid stations to determine their needs and estimate what problems might develop. He found that all facilities were adequately staffed and the number of injured was less than he had anticipated.

The next day the health officer conferred with the county coroner to determine that positive identification of the dead was made before disposition of the bodies. It was necessary in some instances to make identifications through dental work. Three badly burned bodies were identified with the help of the Oregon Crime Laboratory, located at the University of Oregon Medical School.

Several physicians' offices and pharmacies were located inside the blockaded area. The city overlooked giving priority to restoring access to these facilities. Patients were not allowed passes to enter the blockaded area. When this came to the health officer's attention, he served as liaison between the physicians and city officials in securing passes for patients.

There were no cases of illness or personal injury reported during or following the emergency that were attributed to the lack of proper control of public health hazards arising from the explosion. This is not to imply that no such illness or injury occurred, but certainly cases were so few that they were unreported, and no epidemics of any nature developed.

Recommendations

In any disaster situation, it is possible to point out what could have been handled differently and possibly better. This is as true of the Roseburg disaster as any other. Most of the recommendations listed here are subscribed to by civil defense agencies. The Roseburg disaster serves again to emphasize a community's need for an active disaster preparedness organization with adequate mobile support.

1. Have trained sanitarian aides available. They would have been very useful, especially the first 3 days following the Roseburg disaster, to control the disposition of contaminated and adulterated food.

2. Organize all types of health, medical, safety, and police personnel to provide mutual aid and mobile support similar to that already in practice for fire departments. Such an arrangement would help assure any community of adequate trained personnel to cope with a disaster situation.

3. Outline clearly in each department or agency a chain of command in depth. This need was demonstrated in the Roseburg fire department. The fire chief was incapacitated by a heart attack and the assistant chief was killed by the blast. Next in command had not been established and valuable time was lost before the responsibility for directing the firefighting operation had been fixed. A similar situation could arise in any organization at any time.

4. Maintain pertinent records on patients receiving emergency treatment. Lack of addresses for patients in transit or displaced persons made followup of some persons difficult or impossible. Plans should be devised to facilitate followup.

5. Give a high priority to the restoration of hospitals, clinics, physicians' offices, and pharmacies. The pass system, if utilized, should permit patients to visit these facilities when approved for public occupancy.

Summary

The Roseburg disaster resulted when a truck laden with 6½ tons of highly explosive material was detonated by fire within three blocks of city center at 1:15 a.m., August 7, 1959.

The blast and fire virtually leveled 8 square blocks, caused structural damage in a 25-block area, and lesser damage in a 75-block area. Thirteen people were killed and 57 treated for injuries. Property damage exceeded \$12 million.

The health and medical emergency aspects of the disaster were comparatively minor considering the damage which occurred. Health and medical problems might have been much

greater had the fire and blast occurred at another time.

All windows in the business area were blown out. Glass fragments were driven with a force that caused them to penetrate food, clothing, upholstered furniture, bedding, and other articles. The Douglas County Health Department, with assistance from the State board of health and other agencies, maintained rigid control to assure that spoiled or adulterated food and otherwise damaged merchandise were not offered for sale.

Through a concerted and coordinated effort of city, county, State, and Federal agencies in cooperation with businessmen and the general public of Roseburg, vital services were restored and most businesses allowed to reopen within a reasonable period of time.

Roseburg's two general hospitals and one veterans hospital treated the injured. One hospital in Eugene, Oreg., was alerted but was not needed for the emergency. One general hospital, where the triage system was instituted 1 hour after the explosion, became the main emergency treatment facility for 39 patients. Approximately 120 hours of physician time were required for emergency treatment.

The county health department crossed many jurisdictional lines to fulfill its function of protecting the health of the public. The department staff worked to insure that the following essential services were provided: (a) adequate and safe water supply; (b) maintenance of sanitary sewage and refuse disposal; (c) provision of emergency first aid and medical treatment; (d) adequate nursing, medical, sanitation, and ancillary personnel; (e) emergency shelter and food; (f) proper identification and disposal of the dead; (g) control over storage, preparation, sale, and disposition of foods, drugs, and perishable products; (h) control of potentially hazardous merchandise, such as clothing, furniture, bedding, and all soft materials subject to glass damage; (i) informing the public on matters of individual health and measures to be taken for protection; and (j) liaison between the medical profession and city officials in promoting prompt restoration of medical services to the public.

Translated Readings

The following items have been culled from the CIA *Scientific Information Reports*, distributed by the Office of Technical Services, U.S. Department of Commerce. Numbers following each item refer to the issue and item, in that order. All issues are from the PB 131891 T series.

Pharmacology

Medicinal plants used in Chinese medicine are reviewed by I. I. Gerasimenko, All-Union Scientific Research Institute of Medicinal and Aromatic Plants, Moscow (49, 96).

Public Health

A report on public health in the People's Republic of China, by T'an Chih and Yen Yueh, Moscow, claims that cholera, plague, smallpox, and kala-azar have been "mainly eliminated." A drive to control malaria continues. The number of beds in hospitals and sanatoriums, 570,000, is said to be nine times the number in 1947. In training are 90,000 medical specialists and 159,000 students in the secondary medical schools (49, 102).

Q Fever Study

Serologic tests of 1,466 cattle, 39 sheep and goats, and 20 swine from 15 locations, by V. V. Krasnoshchekova and K. A. Shitov, Voronezhskaya Scientific Research Veterinary Station, found that positive reactions in animals did not always correspond with presence and extent of distribution of Q fever reported among humans (50, 105).

Oncology

Recent publications on cancer research include a report by E. Katinas, Lithuania, on an antitumor preparation called neocyde (52, 119); a suggestion that cortisone therapy may aggravate a neoplasm, by C. C. Dimitriu and V. Beroniade, Rumania (52, 120); analysis of the metal content in malignant tissues in rabbits, by V. I. Gorodyskiy and I. V. Veselaya of Kiev, who found relatively heavy proportions of copper, zinc, and cadmium (52, 121); and a

commentary on the international aspects of cancer research by Prof. N. N. Blokhin, President of the Academy of Medical Sciences, U.S.S.R. (52, 124).

Vibration Sickness

After delineating physical symptoms arising from vibration associated with the use of electric drills, especially hand drills, V. I. Yelgazin, chair of general electrical technology, Tomsk Polytechnic Institute, recommended specific improvements in the design and construction of the instruments (50, 141).

Washing Radioactive Hands

Of six methods applied experimentally, the method recommended by L. A. Il'in for cleansing hands contaminated with phosphorus-32 and yttrium-91 consists of washing in tapwater containing 40 percent household soap, scrubbing for 4-5 minutes, and subsequent scrubbing for 3 minutes with a different brush in a jet of 2 percent HCl (50, 151).

Marine Ultrasonics

Prolonged sonic vibrations, beyond the range of the human ear, are found by F. A. Gurevich, M. S. Levinson, and G. S. Komolova, Krasnoyarsk State Medical Institute and Institute of Physics, to destroy marine organisms by inducing chemical changes in the water (51, 85).

Influenza Diagnosis

A means for rapid determination of the type of virus active in an influenza outbreak is reported by the Ivanovskiy Institute of Virology. Essential to the method is the mass preparation of anti-influenza serums, for distribution to diagnostic laboratories (51, 91).

Occupational Hazard

Workers exposed to vibrations used in compacting reinforced concrete were found by P. S. Kublanova, Erisman Institute of Sanitation and Hygiene, to suffer impairment of perception of low-frequency sounds, even after limited service (51, 107).

Federal Publications

Health Manpower Source Book. Medical School Alumni. *PHS Publication No. 263, section 11; by William H. Stewart, M.D., and Maryland Y. Pennell; 319 pages.*

For each of the 78 active medical schools in the United States basic data are presented on the number of living graduates classified according to location in mid-1959, type of practice, and choice of specialty. Tables for each of the 50 States and the District of Columbia show the relationship between the medical school attended and the location of non-Federal physicians in 1959.

The information should be useful to persons and organizations concerned with the provision of medical services for specific localities.

Cataract and Glaucoma. Hope through research. *PHS Publication No. 793 (Health Information Series No. 99); 1961; 16 pages; leaflet; 15 cents, \$11.25 per 100.* Stresses importance of regular eye examination by an ophthalmologist of persons 40 years and older. Explains the difference between glaucoma and cataract, the two leading causes of blindness in the United States. Describes the tonometer test by which glaucoma can be discovered for early treatment before loss of field of vision occurs. Summarizes research efforts in both these blinding ailments.

A Suggested System of Uniform Expense Accounting for Nursing Homes and Related Facilities. *PHS Publication No. 835; 1961; 132 pages; \$1.*

Developed jointly by the Accounting Committee of the American Nursing Home Association and the Public Health Service, this manual has been designed to assist administrators of nursing homes and related facilities in recording expenses uniformly. This expenses accounting system is sufficiently flexible to be easily adapted for use by a majority of nursing homes.

A uniform chart of expense accounts and illustrations of accounting procedures and records to meet individual needs are presented.

Highlights of Research Progress in Allergy and Infectious Diseases, 1960. *PHS Publication No. 829; 1961; 71 pages; 30 cents.*

Major accomplishments in research on viral diseases, allergy-immunology and parasitic, bacterial, fungal, and rickettsial diseases are included. In addition, detailed reports are presented on subjects of special significance in the NIAID program: staphylococcal infections, cystic fibrosis, international research centers, Simian malaria in man, and the Middle America Research Unit.

The work of the NIAID scientific staff as well as grant-supported studies is described.

Organization and Staffing for Local Health Services, January 1, 1960. *PHS Publication No. 682; by Clifford H. Greve and Josephine R. Campbell; 60 pages; 40 cents.*

Data from 1,557 local health units show extent of coverage of the Nation by local health organizations; selected characteristics of organized areas, such as population size, land area, and density of population; personnel employed by official and other agencies; and the financial capacity of organized areas and their expenditures for public health.

Proceedings, 1961 Annual Conference of the Surgeon General, Public Health Service, With State and Territorial Mental Health Authorities. *PHS Publication No. 851; 1961; 48 pages.*

The actions taken at the January 1961 conference are recorded, and the following six group discussion sessions are summarized: regional planning and development; State mental health acts and financing; prevention of mental illness and promotion of mental health; community mental health centers: (a) adminis-

tration and organizational aspects and (b) program aspects and rural problems; and organizational setting for mental health programs.

A discussion summary is included on an ad hoc committee's report on planning of facilities for mental health services, as well as addresses given at the general sessions.

Water and Sewer Bond Sales in the United States. *PHS Publication No. 837; 1960; 10 pages.*

Summary tabulations of water and sewer bonds sold during 1960 are presented by month, population of the issuing authority, type of issuing authority, State, and net interest cost. Tabulations showing the weighted average net interest cost by months, population of the issuing authority, and size of the offering are included.

Data pertain to bonds sold to finance public facilities only.

Directory of State and Territorial Health Authorities. *PHS Publication No. 75; revised 1961; 105 pages; 35 cents.* Brings up to date the listing of personnel of State and Territorial health departments and other State agencies administering grant programs of the Public Health Service and the crippled children's grant program of the Children's Bureau.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

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Footnotes should be worked into the text or offered as supplemental items.

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